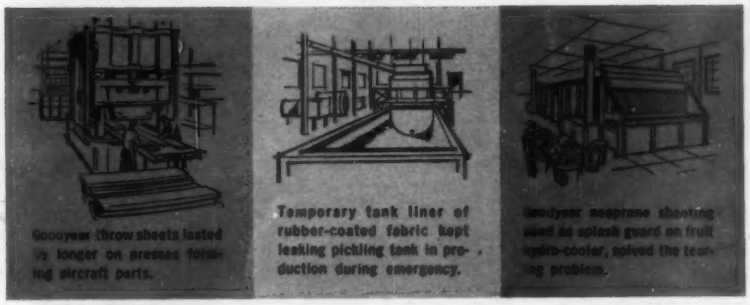
Whether searching for super-smooth sealers.....

You can actually see the advantage of using the new Goodyear packing. The new, amazingly smooth "plate finish"—at no price premium—assures a tighter seal with less sealing pressure. And that's in addition to exceptional resistance to aging and hardening, thanks to the superlative compounding of top-grade rubbers.

...a way to "ground" giant grindstones.....

Six-hundred-pound abrasive wheels drop safely to the floor from a 5-foot height onto a section of steel-backed rubber Armaplate. Heavy rubber sheeting lasted one week on this rugged job; Armaplate over a year.

...or rubber for most any other use.....



Goodyear throw sheets lasted ½ longer on presses forming aircraft parts.

Temporary tank liner of rubber-coated fabric kept leaking pickling tank in production during emergency.

Goodyear neoprene sheeting used as splash guard on fruit hydro-cooler, solved the tearing problem.

And that's only a sample of the unusual problems solved by the G.T.M.—Goodyear Technical Man—and his colleagues with special rubber products.

To turn top rubber experts loose on your problem—even if you've never before thought of rubber as a possible answer—contact the G.T.M. through your Goodyear Distributor—or by writing Goodyear, Industrial Products Division, Akron 16, Ohio.

...you'll find what you need at...

GOODYEAR

THE GREATEST NAME IN RUBBER

For more facts circle 502 on Reply Card

Armaplate—T. M.
The Goodyear Tire & Rubber Company, Akron, Ohio

RICHARD H. MORRIS
Editorial Director

EDITORIAL STAFF

THOMAS E. HANSON, *Editor*
R. L. MARINELLO, *Managing Editor*
EMIL B. SKUBIK, *Associate Editor*
H. E. B. ANDERSON, *Associate Editor*
M. E. WEISSMAN, *Associate Editor*
M. E. HENIKEN, *Equipment Editor*
VERNON T. KEMPF, *Electrical Editor*
MILDRED NOVOSEL, *Editorial Assistant*
BEA BERGHORN, *Editorial Production*
FLORENCE JARRETT, *Editorial Assistant*
JAMES E. WILCOX, *Art Director*
RICHARD TREFILEK, *Staff Artist*
TED CIEPLEY, *Draftsman*

KINGSLEY L. RICE, *President*
ARTHUR L. RICE, JR., *Exec. Vice Pres.*
EDWIN C. PROUTY, *Vice Pres.*
EDWIN C. PROUTY, JR., *Secretary*
ARTHUR L. RICE, JR., *Treasurer*
ANDREW W. KRAMER, *Tech. Asst. to Pres.*
JOHN O. AARVOLD, *Prod. Manager*
WM. J. SALKELD, *Asst. Prod. Mgr.*
MARGARET HOAGLAND, *Research Mgr.*
JOSEPHINE GEAR, *Asst. Adv. Mgr.*

DISTRICT MANAGERS

BOSTON & NEW ENGLAND:
Charles R. Lippold
5 Spring St., Riverside, Conn.
Phone: NEptune 7-2210

NEW YORK: Richard Y. Fuller
842 Graybar Bldg., New York 17, N. Y.
Phones: MUrray Hill 5-3779
LExington 2-0308

PHILADELPHIA: Oscar Wilde
1235 Jericho Road, Abington, Pa.
Phone: TUrner 7-6688

JOHN R. MORRISON
Western Sales Manager

CHICAGO: John R. Morrison
Walter Painter
Robert L. Dickson
110 S. Dearborn St., Chicago 3, Ill.
Phone: DEarborn 2-5453

OHIO-MICHIGAN:
Robert L. Dewey
557 W. Glenwood St.
North Canton, Ohio
Phone: HYacinth 9-7593

PITTSBURGH: James B. Tafel
404 Frick Bldg., Pittsburgh, Pa.
Phone: COurt 1-4878

CALIFORNIA:
Connie J. Grabb, Jr.
1145 Wellington Ave., Pasadena, Calif.
Phone: MUrray 1-6004

DENVER: McDonald-Thompson
Robert H. Heidersbach
620 Sherman Street
Denver 3, Colo.
Phone: KEystone 4-4669

WASHINGTON-OREGON:
McDonald-Thompson
Harry Abney, 1008 Western Ave.
Seattle 4, Wash. Phone: MAin 3-3766

SOUTHWEST: McDonald-Thompson
Parker Harris
2727 Oak Lawn Ave.
Dallas 19, Texas. Phone: LAkeside 1-1266

Frank N. Vickrey, Rm. 214
3217 Montrose Blvd., Houston 6, Texas
Phone: JAckson 9-6711

GREAT BRITAIN:
Brayton Nichols, Director
The American Magazine Group
151 Fleet Street
London E.C.4, England

Copyright 1959 by Technical Publishing Co., 308 E. James St., Barrington, Ill.

'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Hope To See You at Booth 232

PLANT ENGINEERING editors will be on hand at Booth 232 during the Plant Maintenance and Engineering Show at Convention Hall in Philadelphia, from January 25 to the 28.

Please feel that the booth is your "home away from home" and come in whenever you like—be it to rest your feet, talk with the editors, or just watch the scenery. You're most welcome.

1960 Plant Maintenance and Engineering Conference

HERE IS A BRIEF review of some of the papers which will be presented at the 1960 Plant Maintenance and Engineering Conference. The conference, to be held concurrent with the first three days of the show, will be at Convention Hall, Philadelphia, from January 25 to the 27. The show will be from January 25 to the 28.

Some of Monday's session will cover the following: Maintenance Stores Control, Maintaining Electronic and Other Control Systems, Working Against Air and Water Pollution, and round table discussions on maintenance in various industries.

Tuesday's sessions will be about: Welding Advances Adaptable to Maintenance, Sanitation Control, Electrical Maintenance in Large Plants, Getting at True Maintenance Costs, and many others.

Wednesday's sessions will discuss: Incentives in Maintenance, Maintenance of Materials Handling Equipment including computer and manufacturing procedures, and maintenance of electronic and hydraulic equipment in the numerical control system.

Numerical Control Training Program for Maintenance Men

TO ASSIST industry in the conversion from conventional to numerically controlled machine tools, the Industrial Controls Section, Bendix Aviation Corporation, Detroit, Michigan, is providing a numerical control training program for programmers, operational and maintenance men.

The training program includes all phases of part programming and processing including computer and manufacturing procedures, and maintenance of electronic and hydraulic equipment in the numerical control system.

If you would like more information about this training program, write to Industrial Controls Section, Bendix Aviation Corporation, 21820 Wyoming Ave., Detroit 37, Mich.

This training class is being instructed in the operation and maintenance of a numerical control system. Classes are conducted at the Bendix training center.

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by the 15th of month to make the change effective with following month's issue. Published monthly and accepted as a controlled circulation publication at Chicago, Ill.

View of a modern cafeteria showing sanitary Natco Vitritile walls.

Design complete sanitation into your next plant cafeteria

Everything about a plant cafeteria should reflect spotless sanitation. Not only the sparkling-clean food handling and processing and serving equipment—but the very walls themselves! Walls constructed of ceramic glazed Natco Vitritile will assure you of complete cleanliness and sanitation. Because Vitritile's facing is of a durable moisture-proof ceramic glaze, it's easy to keep clean all the time. It requires only occasional cleansing with common soap and water.

Vitritile comes in a complete range of attractive colors to fit any color scheme. The colors—and the finish—are permanent. Cannot stain or discolor. Never lose their original brilliant appearance.

For complete information on this—and other Natco structural clay tile products—write for a free descriptive, illustrated "full line" catalog.

Natco Vitritile is a completely fireproof, load bearing genuine fire clay building material that is also ideal for hallways, stairwells, locker rooms, rest rooms, and many other uses in the modern plant.

FTI STRUCTURAL FACING TILE INSTITUTE

NATCO CORPORATION

GENERAL OFFICES: 327 Fifth Avenue, Pittsburgh 22, Pennsylvania
OTHER BRANCH SALES OFFICES: Boston, Chicago, Detroit, Houston, New York, Philadelphia, Pittsburgh, Syracuse, Birmingham, Ala., Brazil, Ind.
IN CANADA: Natco Clay Products Ltd., 57 Bloor Street, West, Toronto

NATCO QUALITY CLAY PRODUCTS SINCE 1889

For more facts circle 503 on Reply Card

PROTECT Your Machinery with
THOMAS
ALL METAL
FLEXIBLE COUPLINGS

NO LUBRICATION
NO MAINTENANCE
NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.
They will protect your equipment and extend the life of your machines.
Properly installed and operated within rated conditions, Thomas Flexible Couplings should last a lifetime.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES:

- Freedom from Backlash
- Torsional Rigidity
- Free End Float
- Smooth Continuous Drive with Constant Rotational Velocity
- Visual Inspection While in Operation
- Original Balance for Life
- No Lubrication
- No Wearing Parts
- No Maintenance

Write for Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

For more facts circle 504 on Reply Card

'ROUND ABOUT

ment, Data Processing Equipment in Maintenance Work, Plant Engineering Planning to Combat Flood and Tornado Disaster, and many others.

A full listing of all the papers along with pictures of the speakers will appear in our January issue.

Should you wish conference registration information, write to Clapp & Poliak, Inc., 341 Madison Avenue, New York 17, N. Y.

Leadbeater Named Shop Superintendent

H. W. Leadbeater, who had been plant engineer at The American Pulley Company, Philadelphia, Pa., has been made shop superintendent. He will be responsible for all shop operations.

He came to the company in 1951 from American Engineering Co. He attended Pratt Institute and is currently serving as vice president of the Philadelphia Chapter of the American Institute of Plant Engineers.

All About Cutting Fluids

TODAY, THERE ARE many blends and compounds of cutting fluids for every modern machining requirement. The question is: Are you using the right cutting fluid for the various jobs in your plant? To find the answer, you have to examine three things: the material, the operation and the tools.

These three phases are covered in detail in the book, Metal Machining with Cutting Fluids. After describing and evaluating these three items, the book discusses the various compositions of cutting fluids to assist you in selecting the correct ones for your operations.

If you would like a copy of this book, send your request, on company letterhead, to Gulf Oil Corporation, Department DM, Pittsburgh 30, Pa.

Hydraulics and Pneumatics Training Course

"INSTALLATION, Operation and Maintenance of Fluid Power Equipment," is the title of a home-study training course which is being offered by Hitchcock Publishing Company.

The course consists of 18 chapters covering such subjects as: hydraulic power devices; air filters; pressure regulators and lubricators; directional control valves; pressure controls; accumulators; and pressure boosters.

For more information regarding this training course, write to Warren Hoffman, Director, Training and Industry Division, Hitchcock Publishing Co., 222 E. Willow Ave., Wheaton, Illinois.

Plastic Pipe Standards

SEVERAL STANDARDS have been published by the Superintendent of Documents for ABS plastic pipe.

CS218-59 covers requirements and methods of test for rigid ABS pipe. CS219-59 covers dimensions and tolerances for solvent welded ABS pipe. CS220-59 covers dimensions and tolerances for lightweight ABS pipe. All three standards provide a means of identification or labeling.

Copies of these standards may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at the following prices: CS218-59—10 cents; CS219-59—5 cents; CS220-59—5 cents.

59 Cocooning Enclosures Tested

WHICH COCOONED enclosure is best for outdoor storage of materials? To answer this question, the Quartermaster Corps conducted tests on various types of cocoon enclosures to find out which ones would be best in design, construction and materials. All types were tested under weather conditions similar to those at Richmond, Virginia.

During the four-year study, 59 adaptations of cocooned enclosures were erected for experimental storage of hard goods, (metal and wood items), soft goods (clothing, tentage and leather items), and rations.

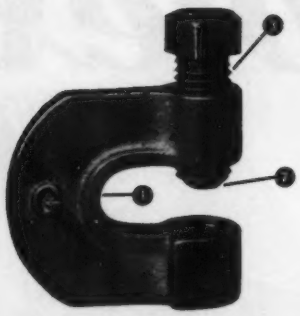
The complete report of their findings is available in the 34-page booklet, Cocooning Storage, from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., at a price of $1.00.

Hurst Named Plant Engineer

Fred Nelson Hurst has been named plant engineer for Raytheon Company's Semiconductor Division plant now under construction at Lewiston, Maine.

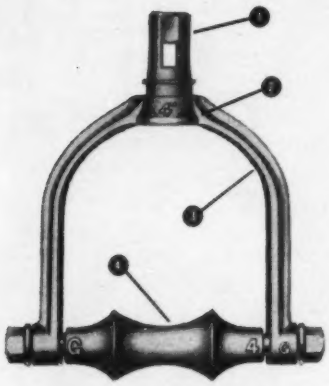
Prior to joining the company in August, he served as plant engineer with Stowe-Woodward, Inc., Sylvania Electric Company, United States Gypsum Company and National Fireworks, Inc.

Look at all the extras you get in Grinnell Pipe Hangers . . . yet you pay no more!



GRINNELL C-CLAMP, FIG. 88 — 1 Ribbed, malleable iron casting, for extra strength **2** Hardened steel, cup-point set screw for good "grip" on beam **3** Full thread engagement – casting is drilled and tapped for rod and set screw

GRINNELL EXTENSION SPLIT RING, FIG. 138 — 1 Nipple engaging thick section of malleable iron gives rigidity for support from above, below or from wall **2** Tapped to take screw. No nut to lose **3** Special ring contour holds pipe or tubing firmly



GRINNELL ADJUSTABLE SWIVEL PIPE ROLL, FIG. 174 — 1 Swivel shank permits adjustment without elaborate support **2** Locking device prevents accidental adjustment change; no lock nut required **3** Ribbed design in malleable iron for better strength, lightness, appearance **4** Easy installation; maximum adjustment

GRINNELL CB CONCRETE INSERT, FIG. 282 — 1 One body size accommodates several sizes of rods **2** Slot takes reinforcing rods to assure maximum load rating **3** One-piece body prevents concrete seepage **4** Teeth on insert and nut hold rod firmly in place **5** Homogeneous composition of malleable iron throughout

You get *more* hanger for the money from Grinnell, because Grinnell's huge volume reduces production costs . . . lowers prices right into line with competitive hangers offering less.

Yet you get *so much more* . . . wider choice of types and sizes; better quality control; published ratings for *all* hangers; faster delivery from warehouses nationwide; and more responsible field service by trained Grinnell personnel . . . regardless of how far from the job site the sale was made! Grinnell Company, 277 West Exchange St., Providence 1, R. I. Branch Warehouses in Principal Cities.

Remember, The Best Costs No More — from America's #1 Supplier of Pipe Hangers and Supports

Call your local Grinnell Distributor for pipe hangers, cast and malleable iron fittings, malleable unions, steel nipples – all made by **GRINNELL**

For more facts circle 505 on Reply Card

Mobilplex ep

The Multi-Service Grease with unique Calcium EP Complex. Never before in a single lubricant such a wide range of use . . . such a margin of superiority . . . such a potential for maintenance savings.

Above: Mobilplex EP produces excellent results in Timken OK-Load tests, provides outstanding performance in heavy-duty equipment.

Heavy- or shock-loaded bearings like these grease-lubricated mechanical press bearings last longer, require less maintenance with Mobilplex EP.

Outstanding load-carrying ability is one of the many important properties of Mobil's new Multi-Service Grease —*Mobilplex EP*. In your manufacturing plant you'll find it provides maximum protection against wear under heavy and shock loads. Mobilplex EP also offers excellent resistance to heat, and extra protection against soluble oil emulsions and corrosion. It is a singularly tenacious and adhesive lubricant.

This Multi-Service grease has outstanding oxidation resistance as well as excellent structural and storage stability. These qualities—plus the great versatility of Mobilplex EP—make it useful throughout the plant.

Plant operators throughout the country are finding Mobilplex EP extremely effective in extending bearing life and protecting production schedules. In addition, they're saving more than with ordinary multi-purpose greases because Mobilplex EP makes it possible to reduce application frequency, simplify storage and handling procedures.

Contact your Mobil representative for full details. He can show you results of laboratory performance tests of Mobilplex EP and five leading competitive extreme-pressure greases. You'll see why Mobilplex EP is rated tops!

MOBIL OIL COMPANY, A Division of Socony Mobil Oil Company, Inc.

MULTI-SERVICE ABILITY OF MOBILPLEX EP

ANTI-FRICTION BEARINGS (*horizontal and vertical*). Temperatures in the range of 300 F. Heavy or shock loads. Water contamination. Speeds—low, normal, high.

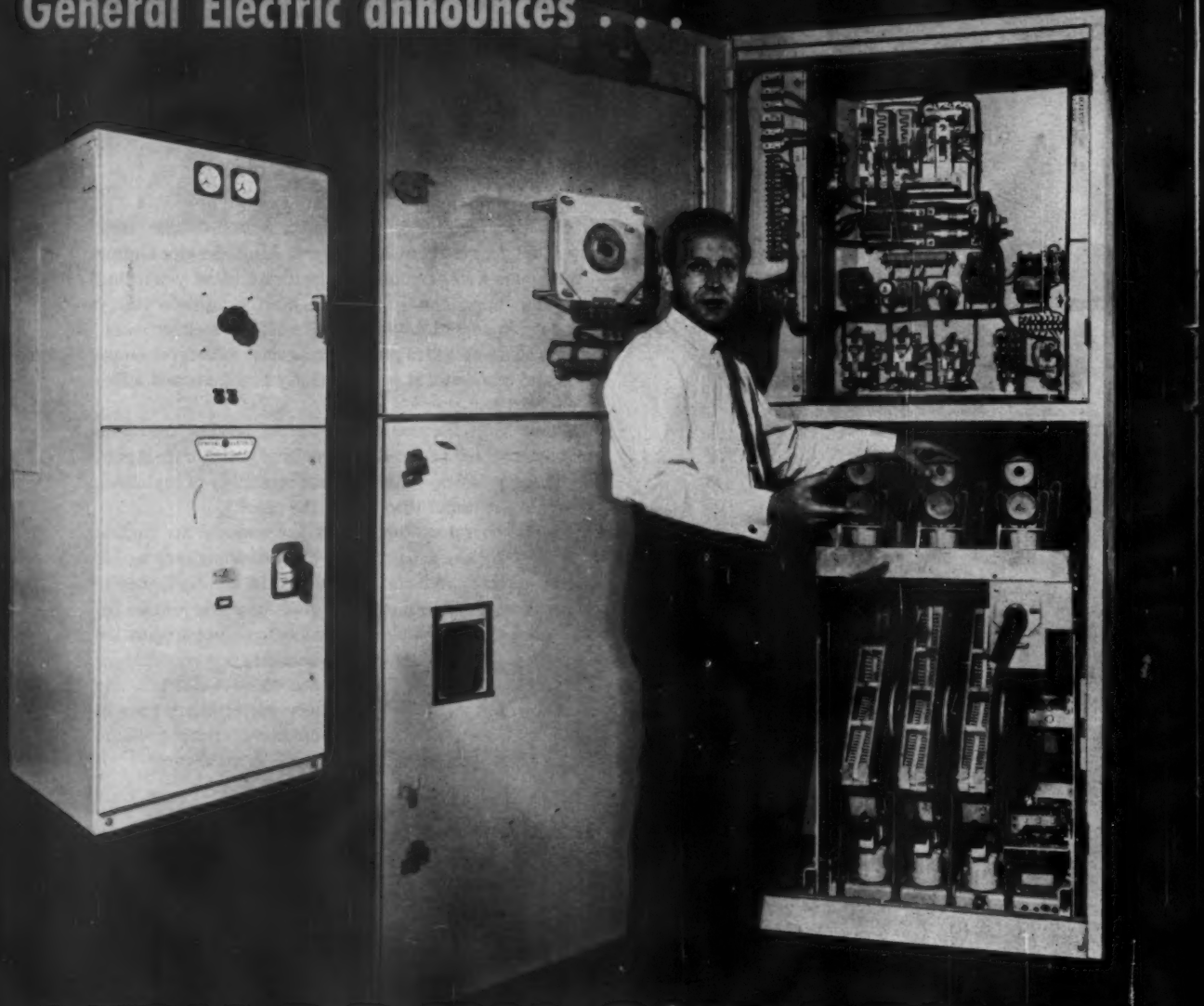
PLAIN BEARINGS All normal mechanical and operating conditions. Temperatures in the range of 300 F. Waterwash. Heavy or shock loads.

DISPENSING AND APPLICATION DEVICES Transfer pumps. Hand and power guns (*long lines*). Central greasing systems.

Mobil

For more facts circle 506 on Reply Card

General Electric announces . . .



NEW DRAW-OUT DESIGN

From General Electric comes the all-new draw-out Limitamp control—today's most advanced medium-voltage motor starter. Designed for the control of a-c motors rated 2300 through 4600 volts and up to 3000 hp, this new air-break starter has broad application throughout industry.

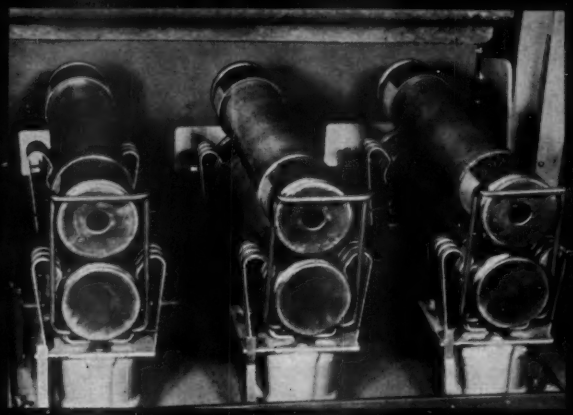
Since its introduction in 1941, Limitamp control has established a reputation for being first with the design features that add up to major user benefits. And, today's all-new Limitamp control follows this pattern with a host of design innovations that make for:

Faster installation: When you're ready to roll in the contactor—it can be done easily by one man. And, there are no connections to make—they are made automatically as the contactor rolls into place. There's plenty of space inside the panel for pulling the motor and power cables . . . and making the connections. And, with the new design, floor sills have been eliminated. This means no more grouting, no expensive cement work, simplified lineup with other panels.

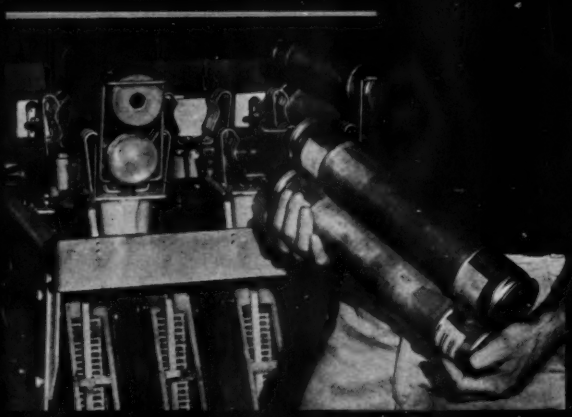
Simpler, safer operation: One handle now controls the complete operation of connecting and disconnecting the starter from the bus and mechanically locking the high-voltage compartment door. A unique interlocking system protects the unit from misuse.

Superior protection: General Electric's new Limitamp

INSTALLS IN HALF THE TIME—Draw-out air break contactor, roomy isolated cable compartments, and increased working space help simplify installation.



LIMITAMP CONTROL IS ISOLATED AUTOMATICALLY—A unique shutter box isolates the starter from high-voltage power when the operating handle is turned to the off position.



INTERRUPTS FAULT IN FIRST ½ CYCLE—Fast-acting, current-limiting fuses interrupt circuit before short circuits cause damage to valuable motors.

NORMAL MAINTENANCE WITH CONTACTOR IN PLACE—All components, including the high-voltage contactor, can be maintained right in the control unit, with complete safety.

LIMITAMP* CONTROL

control utilizes fast-acting current-limiting fuses, ambient-compensated overload relays, and a high-voltage contactor to provide the most "positive" protection for your motors. Proved EJ-2 fuses interrupt a fault in the first ½ cycle, thus reducing damage to valuable motors. The performance of the completely coordinated design has been exhaustively tested in General Electric's high-voltage laboratory to provide the most reliable equipment for your application.

Easier maintenance: Even with these advanced design features, new Limitamp controls are simpler than ever to maintain. All components are accessible from the front for inspection and maintenance—without removing them from the enclosure. A special test circuit is built into each unit—permitting check-out operation before the unit is put into service.

For full information on all-new Limitamp motor control, contact your G-E Apparatus Sales Engineer or Agent today. Or write Sect. 783-10, General Electric Co., Schenectady, N. Y., for Bulletin GEA-6893. Industry Control Dept., Roanoke, Virginia.

*Reg. trade-mark of General Electric Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 507 on Reply Card

HELPFUL WATER CONDITIONING DATA FROM BETZ

NEWEST APPROACH TO STEAM

■ The determination of the sodium content of steam has unveiled the causes of turbine and superheater deposits that heretofore have gone undetected.

Introduction

ENGINEERS concerned with the generation of steam are well aware of the problems produced by impurities in steam. With the trend toward higher steam pressures and temperatures in power plants, the need for increasingly purer steam has become more and more necessary. Designs of steam purifying equipment and drum internals have improved progressively. Yet steam with solids contamination of 0.5 ppm or less still causes troublesome turbine deposits.

Steam Testing Methods

Steam purity testing techniques also have undergone an evolution through the years to keep pace with the demand for purer steam. Originally, gross carryover could be detected by a simple check of pH or by a titration of the alkalinity or chloride content of the condensed steam. Where it was necessary to check with greater accuracy, the time consuming and cumbersome gravimetric determination of solids was employed.

Later, specific conductance was introduced for a rapid check of steam purity. This method is based on the fact that salts dissolved in condensed steam increase conductance. It was recognized early that carbon dioxide and ammonia dissolved in condensed steam contribute also to the conductivity. Therefore, it became necessary to calculate correction factors for the presence of these dissolved gases. Many mechanical degassing devices were designed and developed for the removal of dissolved gases and more recently acid regenerated cation exchangers have been employed.

The evolution of the specific conductance method has permitted rapid determination of steam purity and is the method most commonly employed today.

Yet many plants with steam purity of one micromho equivalent to 0.5 ppm of dissolved solids or less, continue to be troubled with superheater tube failures and turbine blade deposits.

It has become evident that the use of specific conductance for determining steam purity in the range of one micromho or less is not sufficiently sensitive.

Development of Sodium Method

Further improvements in steam purifying devices, the influence of boiler design and operating conditions on steam contamination, and the effect of anti-foams in bringing about the solution of these remaining problems, were at an impasse because of the lack of a sensitive testing method. Faced with this situation, many concerned with steam purity problems, have investigated more sensitive methods. These investigations have led to the development of the sodium technique by flame spectrophotometry. The use of this method allows the detection of as little as 0.0004 ppm of sodium in dilute solutions under ideal conditions; equivalent to a dissolved solids content of 0.0012 ppm.

The initial applications of this method to steam purity studies under plant conditions were based on taking a series of "spot" samples under carefully controlled conditions to avoid contamination during the sampling period. Many studies were conducted using this procedure and a comprehensive discussion of these studies is presented in Betz Technical Paper No. 134B (copy on request).

Portable Field Equipment

Having demonstrated the sensitivity of the sodium technique, further study was given to adaptation of the equipment to permit continuous recording of the sodium content of condensed steam under plant conditions. Figure 1 shows the

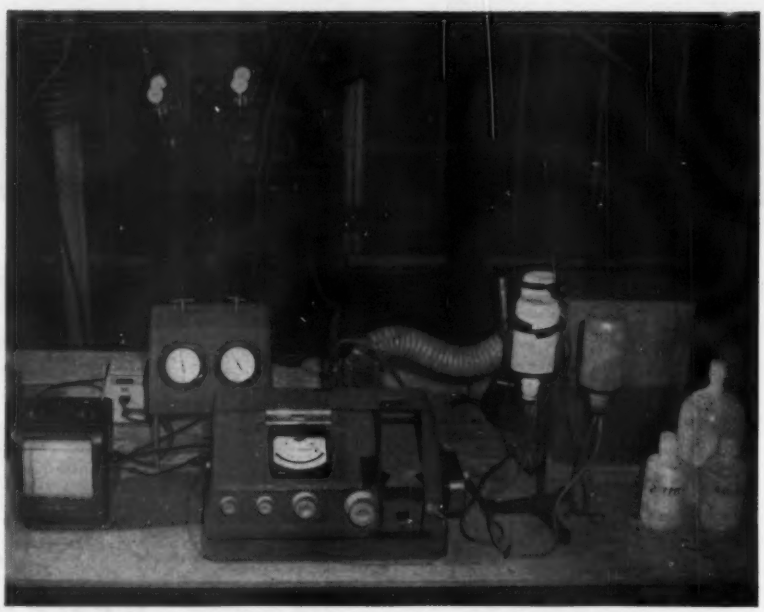


Figure 1—Continuous recording sodium equipment in plant use.

PURITY MEASUREMENT

continuous recording sodium equipment in actual plant use. The supply of a sodium free air to the combustion chamber of the flame photometer was the major problem to be overcome. Air pollution in a boiler room is ever-present. This contamination can be especially troublesome in pulverized fuel plants. However, an MSA ultra air space filter which removes more than 99.9% of all dust particles of 0.3 microns in diameter or greater proved to be the answer. Outside air is passed through the filter and admitted to the burner at a slight positive pressure. This installation has been found completely satisfactory.

In the field equipment as pictured, the steam to be sampled is condensed in a cooling coil and the condensed sample is fed to the combustion chamber. A small portion of the sample is aspirated through a special hydrogen-oxygen burner. Any sodium in the steam will color the normally blue flame a bright yellow. The intensity of this yellow light is measured by the spectrometer at a wave length of 589 millimicrons, the wave length of sodium light. The amount of sodium in the steam is recorded on a strip chart of a Varian Recorder which is calibrated in parts per million as sodium using known standards. Normal procedure in plant studies has been to calibrate in the range of 0.0 to 0.2 ppm. For field work, the Model B Beckman Flame Photometer is used. This unit permits determining the sodium content of the steam with an accuracy of 0.002 ppm, equivalent to a dissolved solids content on the order of 0.006 ppm.

Plant Studies

A sufficient number of studies has been conducted using this portable equipment to attest to its accuracy and reliability for plant studies.

Figure 2 is a reproduction of a section of the strip chart recording the sodium content of the steam from a boiler operating at 650 psi. Previous studies had indicated that steam of acceptable purity on the order of 0.1 ppm of solids was produced at normal boiler rating of 100,000 pounds per hour. However, when the boiler load exceeded this rating, steam purity deteriorated rapidly. It had further been established that only by bringing the boiler back to ratings of less than 100,000 pounds per hour could acceptable steam purity be regained. In an effort to correct this condition new mechanical steam purifying devices were installed.

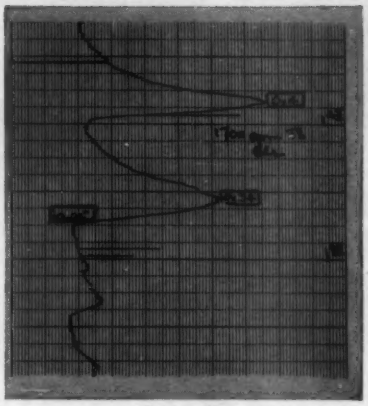


Figure 2.

The section of chart shown in Figure 2 records the sodium values following the installation of the new purifier. The peaks represent maximum steam impurity caused by load swings above 100,000 pounds per hour. These were only momentary increases and steam purity rapidly returned to normal even though boiler rating was maintained above rated capacity, clearly demonstrating the benefit of the new steam purifier. The "boxed" figures on the chart are the steam purity values as ppm of solids.

Figure 3 is an additional section of the chart following the application of an anti-foam to the boiler. It will be noted that the peaks have been decreased further by the application of the anti-foam.

Of significance is that steam purity was consistently below the range in which conductivity would have proved reliable. In the absence of the sodium technique the solution to this and similar problems would be difficult. The use of the sodium technique by no means will replace conductivity as a method of determining steam purity although the need for its greater accuracy has become more and more evident.

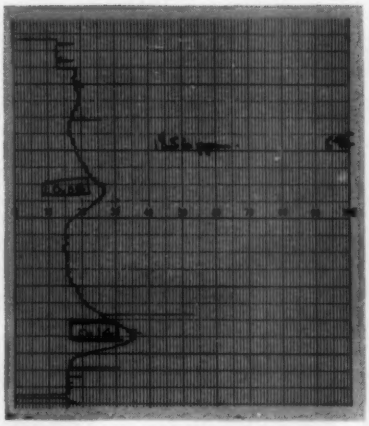


Figure 3.

Betz has pioneered the use of the sodium technique as well as the conductivity method in the study and solution of carryover problems. With an extensive background of experience in this field, we are ready to help in solving *your* particular carryover problem—effectively and economically. A Betz Field Engineer will be happy to call on you, without obligation. A good time to call him in is *today !*

BETZ LABORATORIES, INC.
Gillingham & Worth Streets, Philadelphia 24, Pa.

BETZ

■ CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

Westinghouse develops new motor starters with "monkey proof" safety features

Westinghouse NEMA 12 Life-Line combination starters end unauthorized tampering, offer greater safety and convenience to service personnel

To order simply contact your local Westinghouse representative or distributor now, or write Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.

YOU CAN BE SURE...IF IT'S **Westinghouse**

Watch "Westinghouse Lucille Ball-Desi Arnaz Shows" CBS TV Fridays

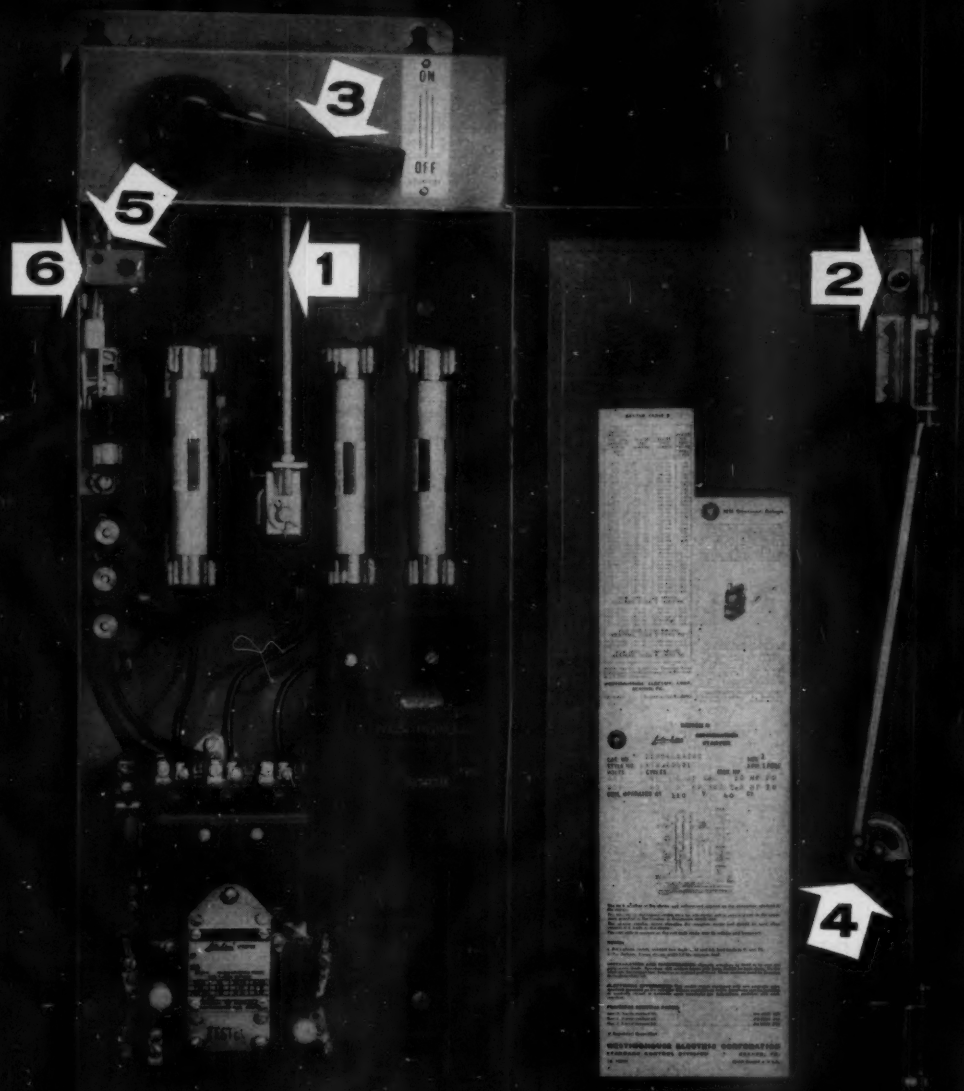
Check these 6 great new safety "firsts"...

1 2 3

SAFE—You always know whether power is on or off because ON-OFF handle is permanently attached to disconnect... even when door is open.

SAFE—Positive gasket seal keeps out oil and dust. An interlock requires that door must be tightly sealed before handle can be moved to ON position.

SAFE—Even when you're out of sight, padlocking ON-OFF handle prevents any operation of disconnect regardless of whether door is *OPEN* or *CLOSED*.



456

SAFE—Discourages tampering by unauthorized personnel. Tool required to open door.

SAFE—Accidental operation of disconnect impossible when door is open. Disconnect interlock must be deliberately voided to operate ON-OFF handle.

SAFE—Interlock prevents door from being opened when switch is on. ON-OFF handle must be in OFF position to open door.

J-30306

"Here at HONEYWELL we're control men

Honeywell
H *First in Control*

"We have a basic philosophy here at MINNEAPOLIS-HONEYWELL. As control specialists, we've learned that it is our *specialist's approach* to design, installation and service that enables our controls and instruments to do their best in operation.

"We feel the same way about elevators. We have 4 OTIS Passenger Elevators and 6 OTIS Freight Elevators in our Minneapolis plants. We know that they'd end up as strangely *mixed breeds* if we attempted their maintenance—because a careful study of the OTIS *specialist's approach* to maintenance has convinced us that only OTIS can keep our elevators running like new."

What is the OTIS *specialist's approach* to elevator maintenance?
It is MEN . . . MATERIALS . . . METHODS.

MEN: Elevator maintenance is no one-man job. It is an organization task requiring experts in many lines. No individual, even if he devoted his entire time to the job, could do it properly. It calls for men with an unusual combination of skills plus long OTIS training in studying parts, assemblies, functions, replacement procedures, testing and adjusting. Some degree of elevator complexity can be gleaned from the illustration at the right.

MATERIALS: Original OTIS parts and specially designed OTIS maintenance equipment are within one hour of 90% of all OTIS elevators in the U. S. for use in scheduled replacements—and to hold emergency shutdowns to a minimum.

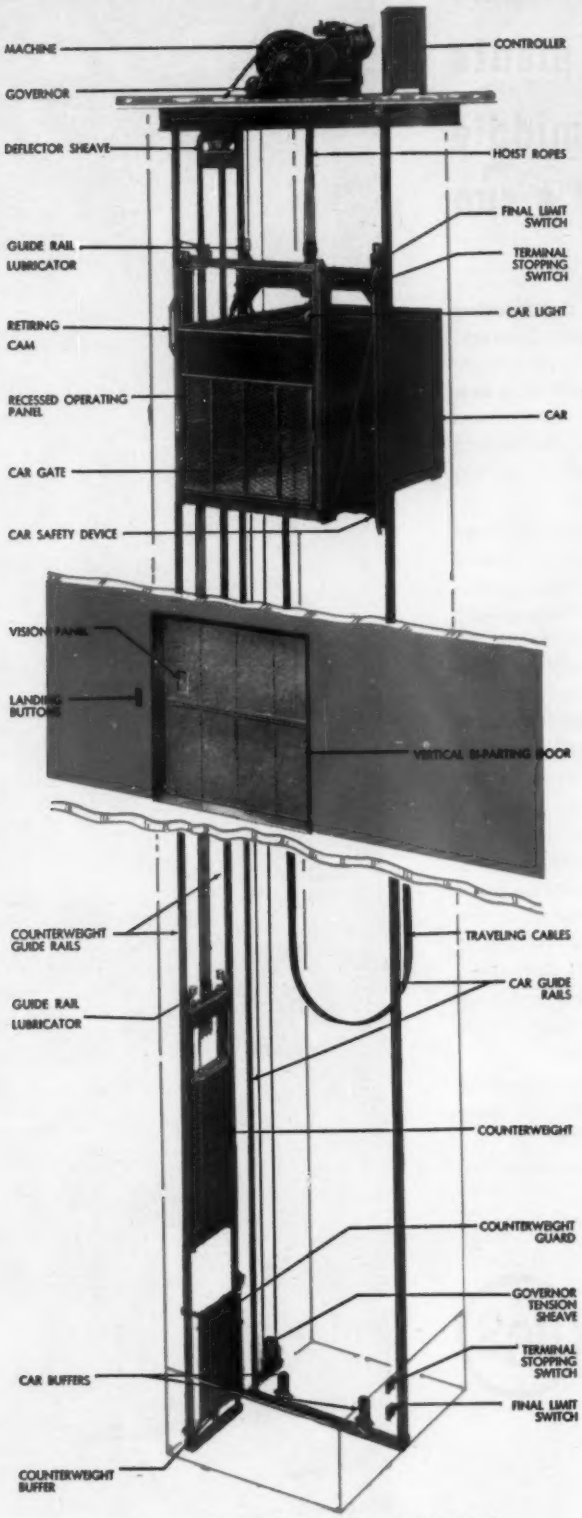
METHODS: With more than 40,000 elevators under OTIS maintenance, OTIS has developed an actuarial procedure that replaces wearing parts well in advance of their breakdown point to hold shutdown to an absolute minimum and assure the highest possible safety.

elevator maintenance
THAT KEEPS ELEVATORS RUNNING LIKE NEW

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.
OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

←For more facts circle 509 on Reply Card

. . . not elevator maintenance men"



For more facts circle 510 on Reply Card

How to change your plants in the middle of a run

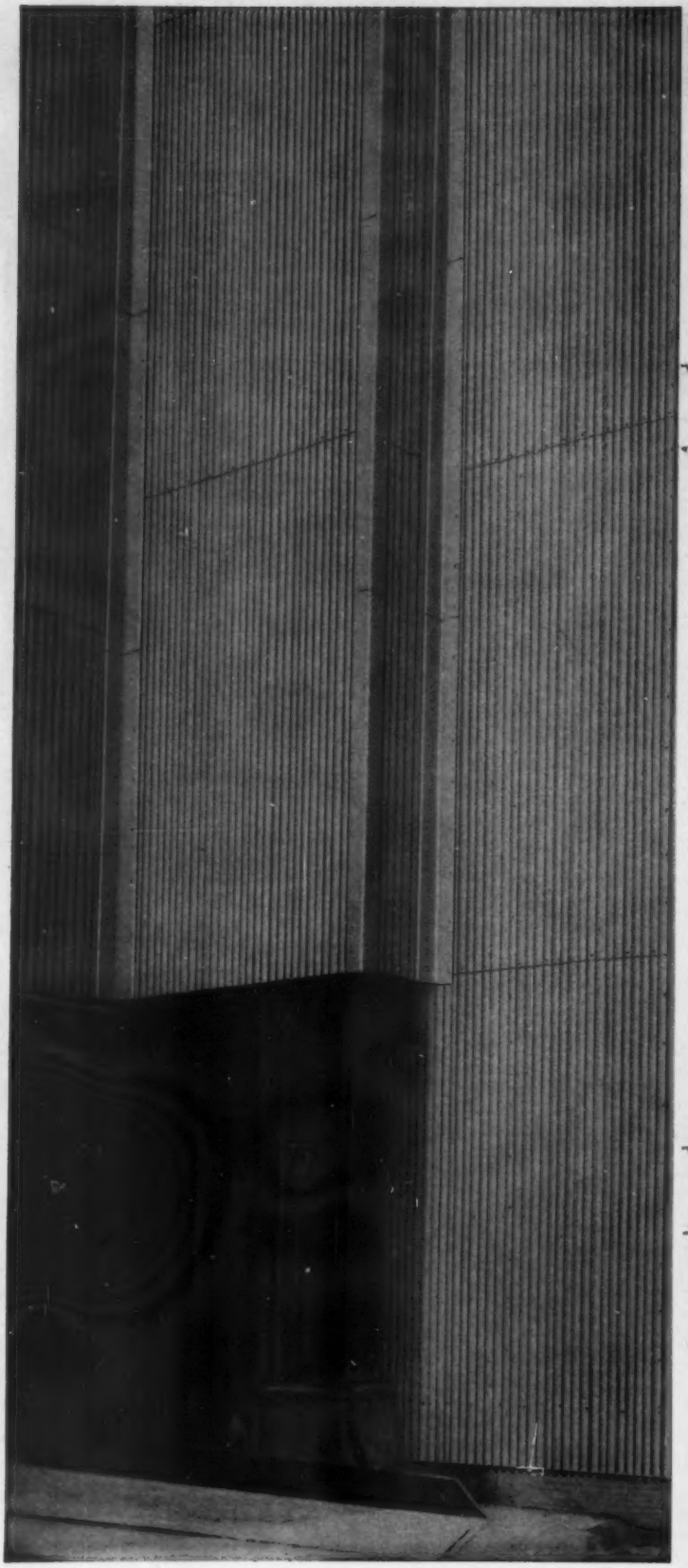
Owens-Corning Fiberglas Corporation had to replace their old plant in Newark, Ohio, but they didn't want to shut down to build a new one. So they built a new shell *around* the old plant. Production never stopped, and when the new building was completed they dismantled the old one and carried it out the door.

The builder applied the new roof and side walls of USS Galvanized Steel Sheets using Fiberglas-reinforced plastic panels for lighting. Both these materials are light and easy to handle, so construction time and labor were reduced. Because USS Galvanized Steel Roofing and Siding Sheets are exceptionally strong and corrosion resistant, there's practically no danger of wind or weather damage to the new building.

Inside the plant are some of the largest furnaces in the world for melting glass. They operate at temperatures over 2,000°F. Here was another reason for the selection of Galvanized Steel Roofing and Siding—it is more fire resistant than other types of roofing and siding and it retains its strength at temperatures that ignite, soften or distort other materials.

Specify USS Galvanized Steel Roofing and Siding for your next re-roofing program or plant maintenance project.

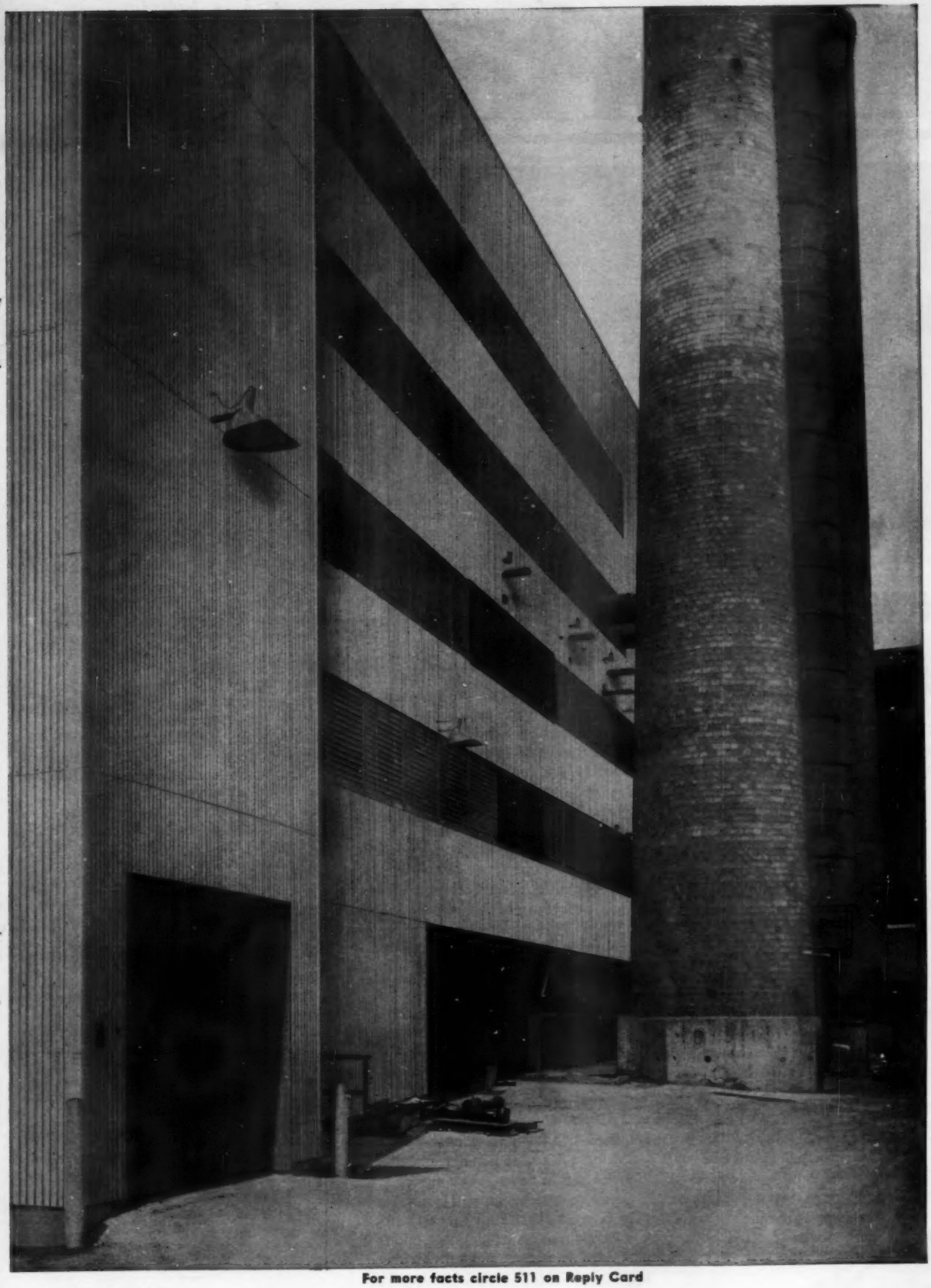
USS is a registered trademark
Fiberglas is the registered trademark of Owens-Corning.



United States Steel Corporation—Pittsburgh
Columbia-Geneva Steel—San Francisco
Tennessee Coal & Iron—Fairfield, Alabama
American Steel & Wire—Cleveland
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

USS



Lubrication

NEW GREASE WITH EP PROPERTIES TAKES 700°F TEMPERATURES

In three years of field testing, a unique new grease called Thermatex EP 1 has:

—lubricated plain bearings operating at 700°F.

—regularly withstood steam pressures of 125 psi at 300-325°F for 20 hour periods.

—effectively lubricated equipment handling corrosive chemicals.

—resisted coking and solidifying in steam joints where temperatures reach 400°F.

Advantage lies in unique combination of properties

Users agree that the major benefit of Thermatex lies in its unique combination of extreme pressure properties with high heat resistance. While several greases now on the market have one property or the other, Thermatex is believed to be the first which effectively combines both.

Maintenance savings stressed

The use of Thermatex has already helped slash maintenance costs in a surprisingly wide number of applications. To indicate its potentialities —here's what happened when it was used in the steam joints of a paper drier machine: The previous grease used by a West Coast paper manufacturer would invariably solidify and coke in the last few feet of its supply line under the 400° heat. These failures occurred as often as every two weeks.

Three years ago, Texaco persuaded the manufacturer to give the experimental grease a trial. Since then, according to the user, no lubrication failures whatever have occurred, and no evidence of coking or plugging has been recorded.

Capabilities and limits

Information now available shows that Thermatex EP 1 will lubricate satisfactorily at 450-500°F when relubrication occurs every 3 or 4 days. It will provide adequate protection at 550°F with more frequent lubrication periods. Over this figure, the grease's useful lubricant life is measured in hours, but a centralized pressure system can still insure completely adequate lubrication.

For complete information and test results, check the coupon.

Oil mist lubrication gaining wide acceptance

Lubrication by means of an oil mist or fog is rapidly proving its advantages in many types of industrial machines. According to plant engineers, use of oil mist can provide a relatively inexpensive, truly centralized lubrication system.

How it works

In this type of system the oil is atomized into extremely fine particles—less than 2 microns in diameter. The resulting fog can be carried long distances through straight pipes and around bends without any appreciable condensation. The oil condenses only on fast moving parts —where it is needed. On slower moving parts reclassification fittings are used to produce either spray or droplets.

Advantages are significant

Proponents of oil mist lubrication cite a number of advantages the system has over conventional lubricating methods. They include the following:

Use of oil mist eliminates the danger of drippage which might contaminate the material being processed. Points which are hard-to-get-at or in dangerous locations can be lubricated from one convenient spot.

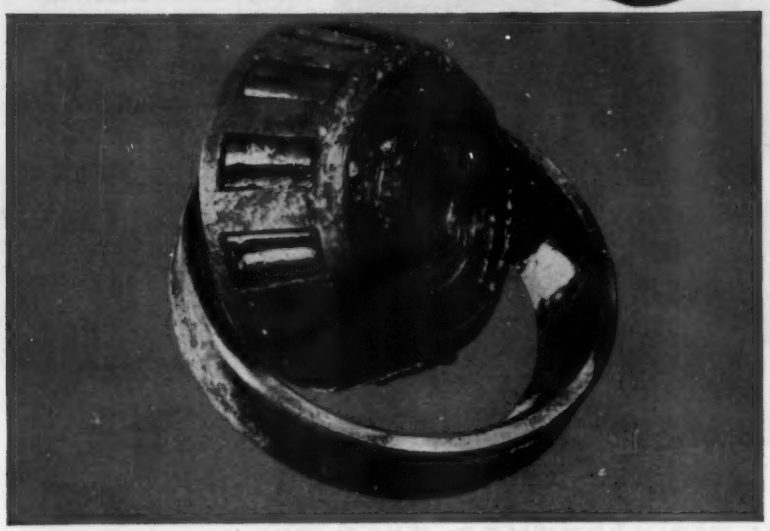
Positive air pressure in the system tends to check the entrance of contaminants such as water, dirt and abrasives—while the air itself provides some cooling effect.

Choice of oil is important

Experts offer a word of caution when it comes to selection of the oil. To be avoided are oils containing graphite, latex, insoluble soaps, fillers or other solids. Best choice seems to be an oil with viscosity at 100°F. (SU) of not over 1,000 seconds.

Texaco products tested and recommended for oil mist applications include Regal Oil PC R&O, Regal Oil C R&O and Meropa Lubricant 1. Test results for these and other recommended Texaco oils are available. Check coupon at right.

news



The difference between Fe_2O_3 and $Fe_2O_3H_2O$ exonerated the lubricant in this bearing failure.

Deposit analysis can uncover surprising reasons for failure

When equipment fails, industry's natural tendency is to blame the lubricant. For this reason, samples of oils and greases—often no more than mere specks—sections of failed gears, bearings, and other ruined pieces of equipment are analyzed at the Texaco Research Center, Beacon, N. Y. Here they are subjected to a searching analysis by technical service experts using a tremendous variety of apparatus and procedures.

Lubricant is seldom guilty

Of the numerous samples submitted every year, the lubricant is guilty in less than 1% of the cases. Take a typical example:

A customer submitted the roller bearing illustrated above. The bearing and its lubricant were liberally contaminated with both red and black material. X-ray diffraction analysis disclosed that the contaminant was an alpha ferric oxide which is characteristic of fretting corrosion—usually correctable only by a design change. Had ordinary rusting occurred the contaminant would have been hydrated ferric oxide—and a finger could have been pointed at the lubricant for allowing water to come in contact with the bearing.

The March, 1958, issue of Lubrication Magazine contains a fascinating series of these "detective" stories. Write for your copy; the supply is limited.

Explains Significance of Lube Tests

The October issue of Lubrication Magazine is designed to give the lubricant user new insight into the significance of lubricant tests. The article demonstrates how the tests —which determine some lubricant properties—can help the lubrication engineer in selection of lubricants for specific equipment. Check the coupon for your free copy.

NEW PRODUCT NEWS

Chemical grinding coolant leaves no oily film—keeps machines cleaner. Helps prevent heat check, permits the use of a finer grit wheel—*Cooltex.*

Selection of cutting or grinding fluids can be critical production problem

Which is best—a straight cutting oil, a soluble oil emulsion, or a chemical coolant? Picking the right type is often a difficult problem, yet the correct choice can often yield major production savings, according to Texaco's chief Metalworking Engineer.

Multitude of factors complicate job

It is pointed out that there is no "best" type of fluid—it all depends on the type of operation. Some cutting jobs, for example, can get by with just a coolant, others—such as automatic screw machines—need a fluid that can lubricate as well as cool, because of inevitable leakage between sumps. Physical properties of the work, high heat—even hard water—can also affect the choice.

Grinding: New chemical coolant adds to choice

Chemical coolants—like Texaco's Cooltex, for example, are comparative newcomers to the grinding operation. However, many operators can point to production boosts of over 200% by using Cooltex instead of an oil. But again it all depends on the particular problems of the operation.

Expert advice can save money

Also underlined is the fact that calling in an expert to discuss cutting oil requirements can pay off for a great many manufacturers. Texaco, for example, maintains a staff of Metalworking Lubricant Engineers from coast to coast, whose prime function is consultation on cutting oil problems.

TEXACO INC., 135 East 42nd Street, New York 17, N. Y., Dept. E-LN-31

Dear Sirs:
Please send me more information on

- ☐ Thermatex
- ☐ Cooltex
- ☐ Recommendations for oil mist lubricants
- ☐ Please send the October issue of Lubrication Magazine

Name_____

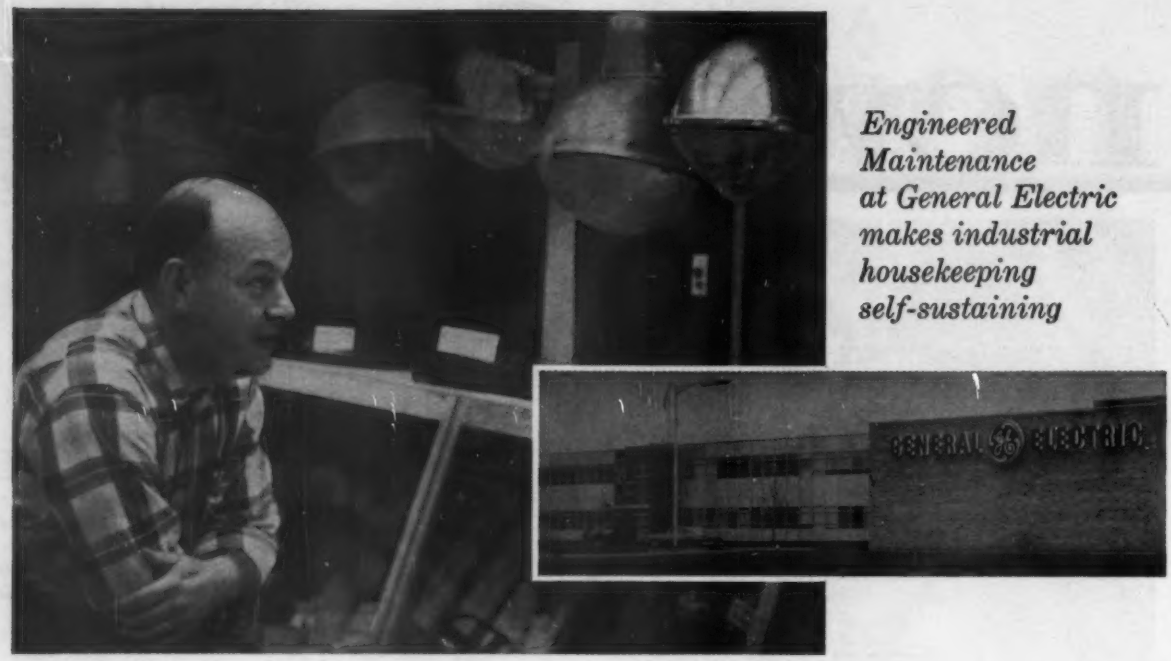
Firm_____

Address_____

City_____

Zone_____ State_____

For more facts circle 512 on Reply Card



Engineered Maintenance at General Electric makes industrial housekeeping self-sustaining

"Now our sanitary maintenance program no longer demands continuing supervision and scheduling"

"Puritan's ENGINEERED MAINTENANCE has practically eliminated the need for constant checking of our custodians' work, thus freeing management for other important maintenance and production functions."

Ralph F. Fiske, Supervisor of Plant Facilities Engineering at General Electric's Outdoor Lighting Department, Hendersonville, North Carolina, also states:

"In what has come to be known as 'the outdoor lighting center of the world,' ENGINEERED MAINTENANCE provides a comfortable, safe, and efficient working atmosphere... another example of the fact that at General Electric, 'Progress is our most important product'."

How Engineered Maintenance works

You receive a complete, individually planned program, based on a personal inspection of your plant, and prepared by professional engineers. The program is set up to meet the exact requirements of your company. Your custodians' work is organized. You are provided with a system of automatic controls. You are certain of continuing follow-through and review, not only by members of your organization, but by Puritan trained service representatives as well.

Why it is so important

In these days of increasing operating costs, more efficient sanitary maintenance is the logical way to protect your company's investment in plant, equipment, and higher pay scales. Management appreciates this... and Engineered Maintenance provides you with a new and tested solution, without requiring you to ask for a larger budget.

Engineered Maintenance is available as a service — without charge to you!

Puritan will inspect your plant, review your present sanitary maintenance procedures, submit and help install an individually planned Engineered Maintenance Program for your company. As a user of Puritan Sanitary Maintenance products you receive this service free.

Puritan products are nationally used, competitively priced, fully guaranteed. You do not pay a premium of any kind for either your Engineered Maintenance Program or for any Puritan product. You are not involved in any long-term contract. The burden of proof is upon us.

New booklet gives more detailed explanation

Write for "Engineered Maintenance." This new technical brochure explains the Puritan program fully... shows how it will help your company... how it will save your time.

COPYRIGHT 1960 PURITAN CHEMICAL COMPANY

PURITAN CHEMICAL COMPANY

EXECUTIVE OFFICES: 916 ASHBY STREET, N. W. • ATLANTA 18, GEORGIA

PLANTS & WAREHOUSES: ATLANTA, GEORGIA • HOUSTON, TEXAS • ST. LOUIS, MISSOURI

For more facts circle 513 on Reply Card

BULLETINS just released and of immediate plant interest

HEATERS, HEATING

101 Improved Unit Heaters—Details on a new heater line for both steam and hot water are described in Bulletin 1301B, 12 pp. A ready reference guide, this catalog is crammed with steam and hot water capacity data, conversion factors and basic formulae, typical quietness levels and piping arrangements. Construction features of both horizontal and vertical discharge models are illustrated. Dunham-Bush, Inc.

102 Direct-Fired Heaters—Gas-fired heaters, furnaces and packaged blowers are described in detail in 28-pp Catalog SA-5900. An illustrated table of contents enabling reader to select heaters and furnaces according to type, applications, capacities, and major features. Sections of book cover fan-type and blower-type unit heaters, five-way air-flow heaters, heavy duty units, duct and forced air furnaces, motorized vent exhauster etc. Specifications, dimensional and performance data are included, also application information. Illustrates suggested methods of installation and arrangement. Reznor Mfg. Co.

103 Controlled Heating Comfort—Economy, low maintenance and other benefits afforded by company's infra-red gas heaters in addition to controlled heating comfort, are stressed in this illustrated bulletin. Two, three and four rayhead models are described in detail and information on placement of heaters is included. Perfection Industries Div., Hupp Corp.

104 Heating Coils—Construction and operating details on heating coils are presented in 32-pp Bulletin HC-102, along with graphs, charts and illustrations for standard steam, hot water, steam distributing and double distributing coils. Included are dimension data, air friction charts, temperature rise charts for pressures ranging from 2 to 30 lb steam, condensate rates, water velocity and pressure drop graphs, heat transfer factor graphs, MTD chart, and other data. American Air Filter Co., Inc.

105 Storage Water Heaters—Design, operation, construction features and installation specifications of a gas-fired storage water heater are presented in 20-pp Bulletin 4. Diagrams and schematic drawings define three basic systems—gas-burning unit, forced circulation transfer fluid system, and service water system. Design specifications, weights, dimensions, capacities and materials of construction are outlined. The Patterson-Kelley Co., Inc.

MATERIALS HANDLING

106 Overhead Handling Systems—Engineered overhead handling systems of track, cranes, trolley, switches, and other electrification, as well as monotractors and auxiliary equipment are featured in 56-pp Bulletin C-2, an "idea book." Hundreds of applications in many industries, and processes within industry, such as handling of bulk materials, steel and wire, shipping operations are illustrated. The American Monorail Co.

107 Floor Trucks—Detailed selection information on floor trucks for a variety of handling operations is presented in 56-pp Catalog 140. Among equipment illustrated and described are platform trucks, stake trucks, semi-live skids, trailers, wagon trucks, shelf trucks, box trucks, two-wheel trucks, miscellaneous equipment. The Hamilton Caster & Mfg. Co.

109 Planning a Loading Dock?—Facts, figures and equipment data of interest to plant engineers planning a new or improved truck loading dock are provided in this handy kit. Featured in the kit is an 8-pp booklet on loading docks and yards, which gives minimum design standards and efficiency ideas. Also covered is the Hi-Lo Adjust-A-Lip Dockboard. Several applications of this unit in, on top of and in front of dock facilities are illustrated. The Kelley Co.

110 For Food Handling—Catalog 459, a buyers' guide to food handling equipment, is sectionalized to simplify selection of equipment best suited to individual plant operation. The first presents hot and cold cabinets to handle requirements from delivery to servicing. Other sections show racks for all preparation and processing; equipment of use in catering service—hand lifts, propane heated cabinets and dollies; food carts, a practical answer to coffee break problems. Another section demonstrates how food serving can be glamorized and food kept oven hot through use of infra-red food warmers. Accessories listed in final section. Crescent Metal Products, Inc.

INSTRUMENTS, CONTROLS

111 Recording Instruments—Twelve-pp Bulletin GEA-6933 provides selection information on company's line of recording instruments, including dimensions and chart speeds, operating specifications, applications, features and accessories. Illustrations of the various models in line included. General Electric Co.

112 Indicating Panel Meters—Featured in 12-pp Bulletin 107 are indicating panel meters and pyrometers in numerous sensitivities, styles and sizes for monitoring any electrically measurable variable. Lists general specifications and groups meters according to case types. Assembly Products, Inc.

113 Process Instrumentation—Twelve-pp Bulletin PI-959 contains detailed information on company's on-stream instrumentation for process industries, including continuous level measurement system, level detector-controller, continuous density measurement system, container fill control systems and others. Specifications, applications given. Industrial Nucleonics Corp.

114 Test Instruments—Catalog G-10 contains 48 pp of detailed information on scientific measurement, recording and testing instruments. Among those covered are d-c amplifiers, data handling systems, lab and calibration instruments, magnetic tape instrumentation, nuclear instrumentation, oscillographs, recorders and indicators, servo components, temperature controllers, and transducers. Industrial Div., Minneapolis-Honeywell Regulator Co.

115 Thermocouple Wells—Catalog G102-1 contains 18 pp of selection data for thermocouple wells and assemblies. Information covers well designs and dimensions, pressure and temperature ratings, corrosion data, thermocouple assembly data, and ordering and pricing. Industrial Div., Minneapolis-Honeywell Regulator Co.

On pages 215-216 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

116 Precision Instrument Components—Master Catalog 20a contains 416 pp of engineering data on company's precision instrument components. Consolidating previous catalogs and supplements, it lists over 10,000 items, including gears, shafts, collars, couplings, speed reducers, differentials and other stock items, contains detailed drawings and specifications. PIC Design Corp.

117 Control Drives—Product Specification P81-1 describes a high torque control drive suitable for high temperature applications to 250 F. Physical characteristics table and other data are included, as well as dimensional diagrams. Bailey Meter Co.

MECHANICAL POWER TRANSMISSION

118 Speed Reducers—Catalog 590 is a 65-pp supplement to company's general catalog on stock gears and speed reducers and provides complete engineering data, dimensions and application selection charts on the Hi-Line series fin and fan cooled reducers. Catalog is pocket size and designed for convenient location of engineering data. The Ohio Gear Co.

119 Motion-Control Sheave—Eight-pp Buletin 8102 features variable-speed sheaves with resilient cam-

BULLETINS

(Begins on page 21)

follower design which will hold a constant driven speed under varying torque loads. Cutaway photos and diagrams showing construction are included. T. B. Wood's Sons Co.

120 Cooling Tower Drive—High-horsepower worm gear drives designed to handle heavy-duty fans under extreme conditions of heat and humidity in cooling tower service are featured in 8-pp Bulletin 135-S. Dimensional data and diagrams, ratings, lubrication data, and installation instructions included. The Cleveland Worm and Gear Co.

121 Roller Bearings—Six-pp Catalog 359 describes a line of heavy duty roller bearings featuring a one-piece cage design which permits use of bearings at higher speeds. Includes design data, load capacity, dimensional and mounting guide, and information on installation and lubrication. The Torrington Co.

122 Pillow Block Bearing—Comprehensive information on pillow block bearings and mountings, their applications, variations, lubrication and installation is provided in 40-pp Catalog 51-59. Described and illustrated is an extensive line of sleeve-type, self-aligning pillow blocks—single-bolt mountings, wall bearings, pedestal bearings, tri-arm bracket assemblies, plain and cushioned flange mountings. Triangle Mfg. Co.

123 Bearing Blocks, Takeups—Detailed information on babbitted, bronze and plain bore bearing blocks and takeups is presented in 16-pp Book 2707. Design features and advantages, illustrations and descriptions of each type of block and takeup and its class of application are featured. Link-Belt Co.

COMPRESSORS

124 Process Compressors—Features and advantages of company's balanced/opposed process compressors for refining, chemical and petrochemical industries are detailed in 46-pp Bulletin 160. Banlanced/opposed design principle is illustrated and described, as well as component features of the compressors, and dimensions, specifications, and photos of typical installations are included. Clark Bros. Co.

125 Unit-Type Compressors—Again available to plant engineers is 12-pp Bulletin SG-2 on unit type compressors. Illustrated in full color, this bulletin uses photos and cutaways to describe single- and two-stage compressors from ½ to 15 hp, available pressures from 80 to 250 psi. Specifications list cfm displacements, pressures, weights, dimensions and rpm. Also covered are parts and accessories. Air receiver and auxiliary storage tank specifications. Le Roi Div., Westinghouse Air Brake Co.

127 Centrifugal Compressors—Three styles of company's single-stage scroll casing compressors—the B style close-coupled, the C style pedestal mounted, ball bearing, and the D style bracket mounted, pivoted-shoe bearing single-stage centrifugal compressors—are illustrated and described in 12-pp Bulletin 16 B 6048 C. Allis-Chalmers Mfg. Co.

VALVES AND FITTINGS

128 Valve Buyer's Guide—In addition to cross indexing company's line with the valves of other manufacturers, this 22-pp Buyer's Guide contains a list of frequently used abbreviations, a valve trim chart, and other data. A breakdown by valve material and pressure class, and classification of type, disc design, seating arrangement, stem operation, bonnet and end connection serves as an additional guide to selection. The Ohio Injector Co.

129 Pressure Reducing Valves—Single-seat, pilot-operated pressure reducing valves are featured in this product bulletin. Installation data, valve operation, dimensions are covered, and photos, drawings, capacity charts are also included. Atlas Valve Co.

130 Check Valves—Detailed information on a line of silent check valves designed to combat surge and water hammer problems is presented in this 20-pp bulletin. Photos of typical installations are included, as well as engineering data and flow charts. Combination Pump Valve Co.

131 Solenoid Valve—Sixteen-pp Stock List and Selection Guide 506 contains engineering data, simple selection guide and illustrations and flow diagrams on company's complete line of solenoid valves. Data is presented in easy-to-use selection tables. Automatic Switch Co.

132 Ductile Iron Regulators—Bulletin J-DI describes characteristics and advantages of ductile iron regulators and control valves which combine the strength of steel with the corrosion resistance of cast iron. Composition, properties, specifications, comparision tables on steel, cast iron and red brass and test results are covered. OPW-Jordan.

133 Pipe Thread Fittings—Advantages of company's pipe thread fittings designed to eliminate positioning problems, leakage and overtightening damage are detailed in this product bulletin. Common types of positioning, distortion, alignment, reworking and leakage problems and their solutions are illustrated, and installation and dimensional data given. Tru-Seal Div., Flick-Reedy Corp.

Postage-free Reader Service Cards make it easy to order bulletins. Cards are provided on pages 215 and 216.

134 Seal-Sealing Coupling—Features and advantages of a quick connect-quick disconnect coupling designed for "no-spill" service are illustrated and described in Catalog 280B. Cutaway drawings, dimensional data, specifications given. Snap-Tite, Inc. Tite, Inc.

Recent References on Safety, Fire Protection

135 For Fire Protection—Folio 1 is a 12-pp revised booklet on fire extinguishing systems and equipment. Lists principal causes of large-loss fires, advantages in use of carbon dioxide, and examples of extinguishing installations in steel, general manufacturing, electrical and other industries. Shows typical systems for protection of generators, flammable liquids, paint spray areas, quench and dip tanks, pumping operations etc. Also describes components and control of systems. Cardox Div., Chemetron Corp.

136 Handling Flammable Liquids—Problems involved in the use of flammables in individual processes, and methods and equipment required for safe control are described in this 76-pp safety handbook. Physical properties and characteristics of most commonly used flammables are detailed, and recommendations for safe handling of these liquids given. The Protectoseal Co.

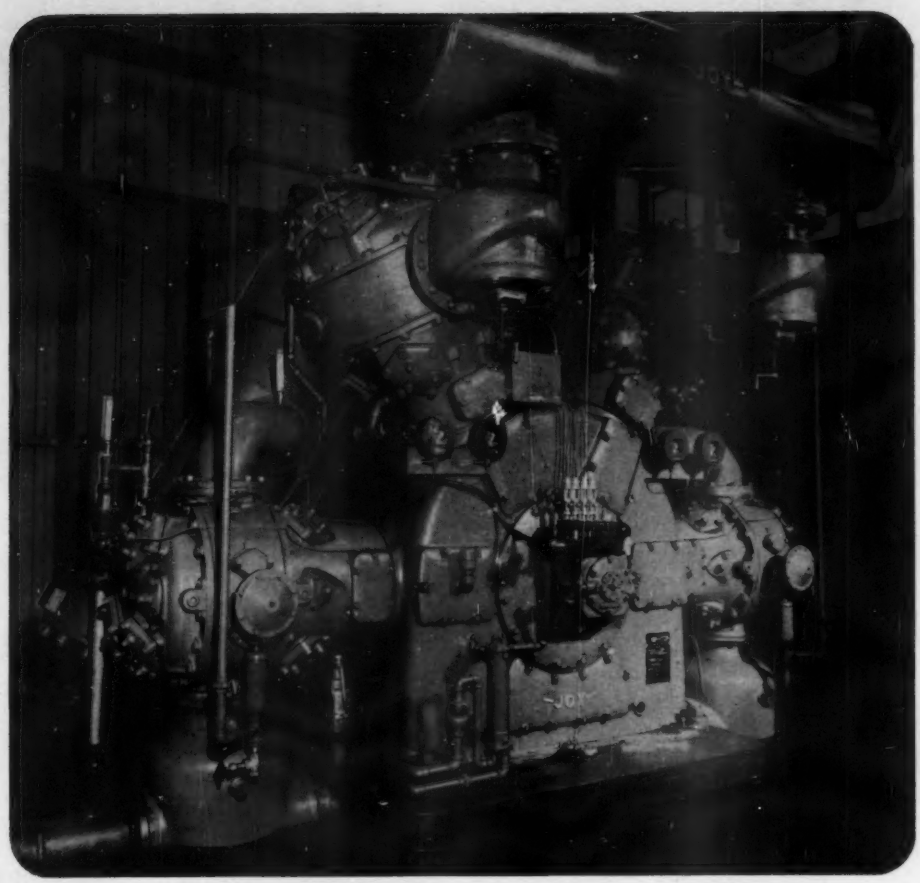
137 Chain Safety Kit—Answers to all types of questions regarding the care, use and inspection of sling chains are presented in this safety kit. Consisting of five folders, each dealing with a different aspect of chain safety, it covers such subjects as inspection procedures, safety cautions, safety terms, working load limits, proper care and use of chain, and maintenance procedures. The McKay Co.

WELDING AND MACHINE SHOP EQUIPMENT

138 Welding Equipment—Twelve-pp Bulletin W-158 features a line of transformer, rectifier and rotary d-c welders for a variety of industrial requirements. Detailed specifications and dimensional data are included. Harnischfeger Corp.

139 Welding Wire Guide—Catalog 2330 is an 84-pp guide to company's line of gas-shielded metal-arc welding wires. Provides convenient answers to questions concerning steel, aluminum, copper and copper base, stainless steel, titanium and special welding wires used with company's welding process, and contains technical information such as chemical composition, mechanical properties, operating procedures, and wire diameters. Air Reduction Sales Co., Div. Air Reduction Co., Inc.

(More Bulletins on page 217)



This WN-224 Compressor supplies plant air to a modern foundry in Indiana.

Joy Design Means:

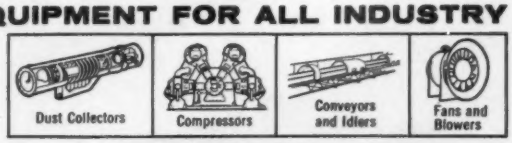
SIMPLE BASE WHICH CUTS COMPRESSOR INSTALLATION COSTS

The semi-radial design of Joy compressors makes installation a simple and inexpensive operation. Machines are completely assembled when shipped from the factory. Installation is accomplished by securing the frame to four studs set in the rectangular concrete pad. Form work is simpler, and the complicated alignment and assembly operations necessary with other compressors are eliminated. The net result is lower installation cost for your compressors.

Joy semi-radial compressors have many other features which enable them to supply plant air at minimum cost by reducing operating and maintenance expense. Your Joy representative can supply complete details, or write for Bulletin 925-15.

925

AIR MOVING EQUIPMENT FOR ALL INDUSTRY



JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

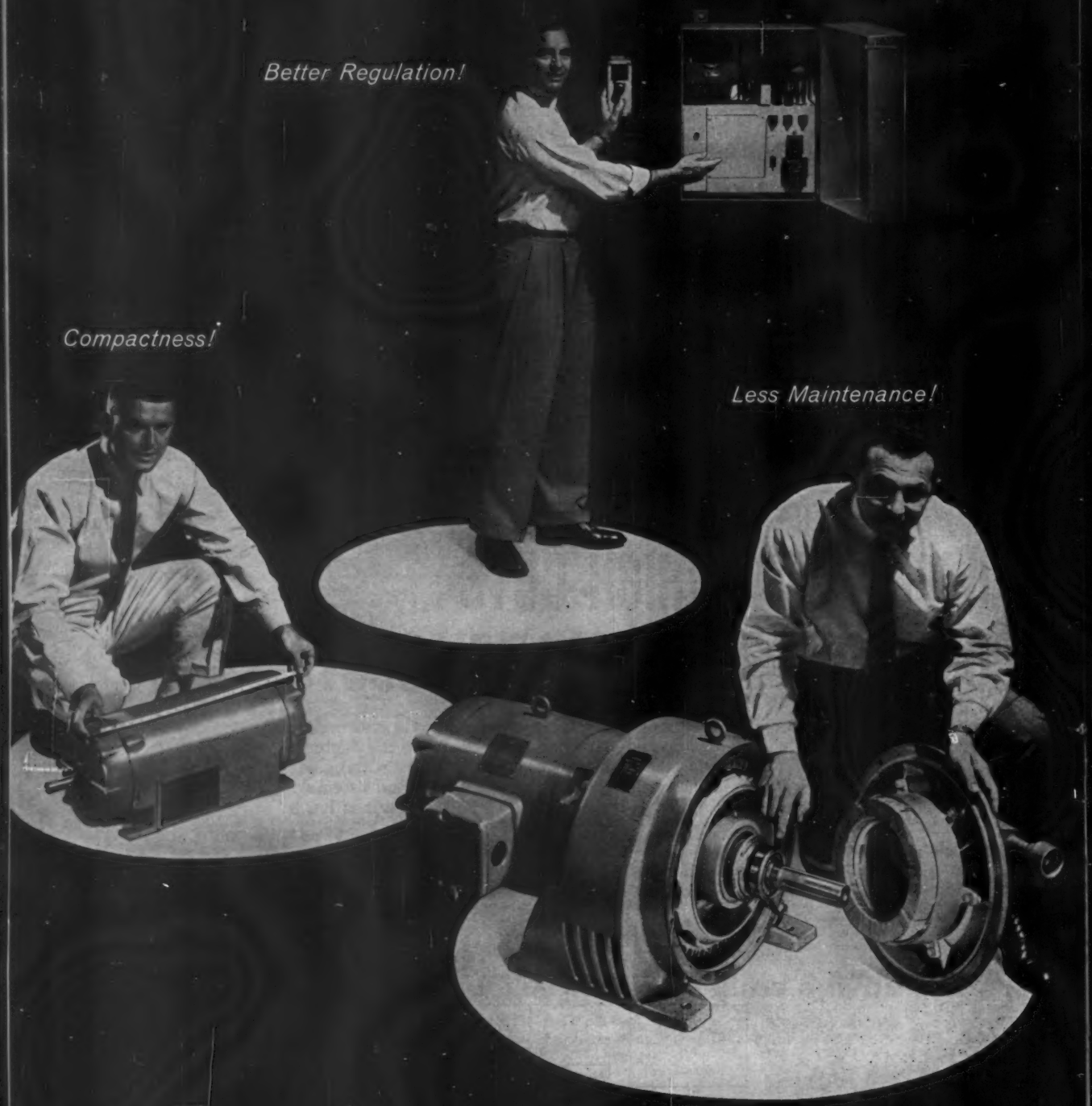
For more facts circle 514 on Reply Card

What do you need in an adjustable speed drive?

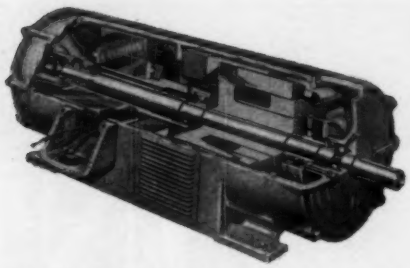
Better Regulation!

Compactness!

Less Maintenance!



7½-hp Ajusto-Spede Drive



Common motor-drive housing for units up to 7½ hp saves space — can be foot or flange mounted. Larger sizes up to 100 hp with individual motor and drive housings mounted integrally.

NEW design news from Louis Allis

...The Louis Allis AJUSTO-SPEDE® drive is more compact, precise, and trouble-free

Here's an adjustable speed drive that allows *truly precise* machine operation. Speed regulation is automatic and stepless — results in faster, more efficient production at lower cost, with less waste, and minimum wear on equipment.

These and other benefits are yours when you use the improved Louis Allis Ajusto-Spede drive. For example, it can be set before or during operation to deliver any desired speed within its range. Its *exclusive* tachometer feedback circuit monitors the output speed and *automatically corrects speed and holds it* regardless of load changes.

This improved drive requires minimum maintenance. Its stationary field has no brushes, commutators, or slip rings to cause trouble. The source of power is an equally trouble-free standard a-c squirrel cage motor. The cast-iron housing keeps out dirt, chips, and moisture — resists corrosion.

The compact Ajusto-Spede also saves space. Integrally-mounted motor and drive simplify handling — can be easily adapted for installation on new or existing machines. Controls can be mounted at the machine or any other convenient position.

The Louis Allis Ajusto-Spede drive is the practical solution to almost every application that requires dependable, easily controlled adjustable speed. It is the answer to precise operating speeds for machine tools, process machinery, test equipment, windups, conveyors, printing presses, and other equipment. Contact your Louis Allis District Office for information and application help. Or write for bulletins 2750 and 2800 — The Louis Allis Co., 434 East Stewart Street, Milwaukee 1, Wisconsin.

® *Ajusto-Spede is a registered trademark of the Eaton Mfg. Co.*

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

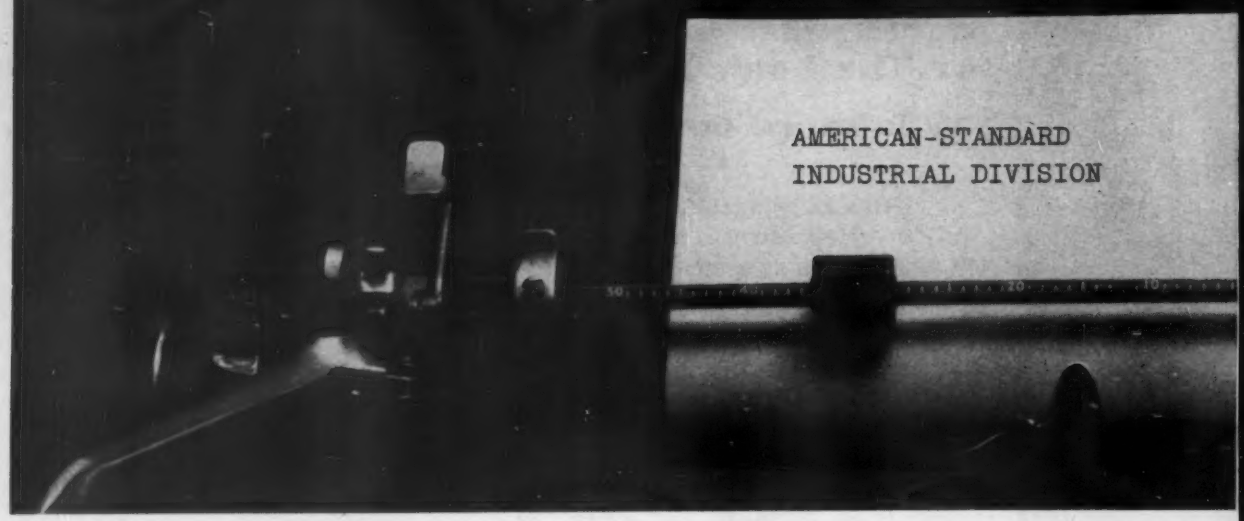
LOUIS ALLIS

ASD-337

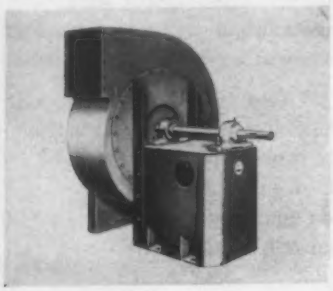
For more facts circle 515 on Reply Card

ONE NAME

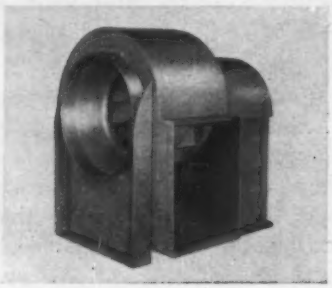
for plant and



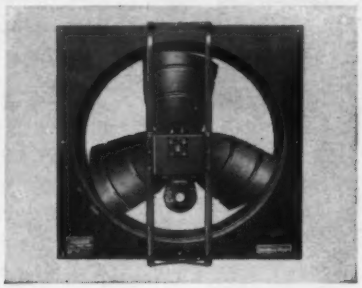
Industrial fans with wheel types for handling air, gases, materials, shavings.



Self-contained ventilating units for supply or exhaust in duct systems.



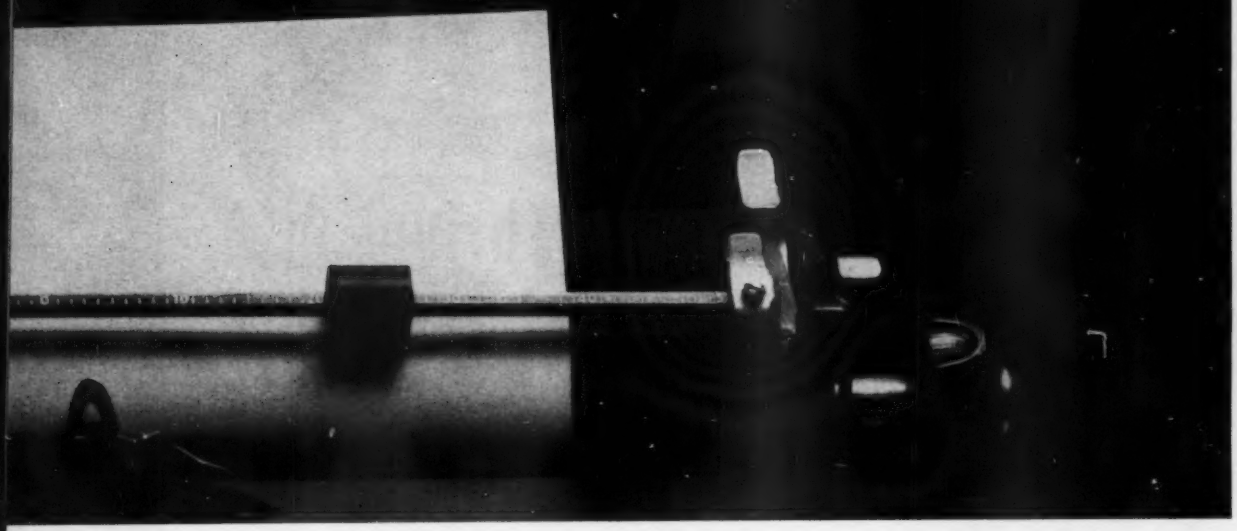
Ventura® fans for heavy-duty ventilating move smoke, fumes quickly and quietly.



One call for all

AIR-CONDITIONING EQUIPMENT: Refrigerating Machines • Water Chillers • Heating and Cooling Coils • Central-Station Air Conditioners Packaged Air Conditioners • Air Washers • **AIR-HANDLING EQUIPMENT:** Centrifugal, Propeller, and Axial Fans • Power Roof Ventilators Utility Sets • Specialized Fans and Blowers • **HEATING EQUIPMENT:** Firebox, Scotch-Type and Packaged Boilers • Steam, Hot-Water, and Gas-Fired Unit Heaters • Heating and Ventilating Units • Cabinet Heaters • **PROCESS EQUIPMENT:** Dust Collectors • Heat Exchangers Lube Oil and Jacket Water Coolers • *Gyrol*® Fluid Drives • Centrifugal Compressors • Mechanical Draft Fans • Surface Condensers

is all you need to know process air-handling equipment



American-Standard* Industrial Division is the name to know for air-moving equipment to handle *every* duty. For, American-Standard's complete line of precision-built equipment ranges all the way from propeller fans for spot ventilation to giant centrifugal compressors that supply vital high-pressure air in industrial processes.

The point is, American-Standard Industrial Division can supply all the components for an efficient plant and process air-handling system tailored to your needs. You deal with one organization. You get one-source responsibility for quality and performance in equipment designed, engineered, and manufactured to work together.

Get in touch with us. Offices in all principal cities are staffed by product specialists to assist with equipment selection and on-the-job problems. AMERICAN-STANDARD INDUSTRIAL DIVISION, DETROIT 32, MICHIGAN. IN CANADA: AMERICAN-STANDARD PRODUCTS (CANADA) LIMITED, TORONTO, ONTARIO.

* American-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation.

American-Standard PRODUCTS

AMERICAN-Standard
INDUSTRIAL DIVISION

AMERICAN BLOWER PRODUCTS • ROSS PRODUCTS • KEWANEE PRODUCTS
For more facts circle 516 on Reply Card

Motors Thrive on FREQUENT OVERLOAD ABUSE!

Brunswick D-31 Precision Bowling Lane Sanders
Powered by Lightweight R&M 8 HP Single Phase Motors

The Brunswick-Balke-Collender Company recently handed ROBBINS & MYERS an unusual motor problem when it re-powered the Brunswick D-31 precision bowling lane sander. The D-31 cuts across 250 square inches of area in one continuous cutting operation. Motor must withstand frequent and severe overloads when the machine levels high spots in the alley bed. Power had to be single-phase, too, because many bowling establishments carry only single phase current! To keep sander truly portable and easily maneuverable . . . and to protect lanes from excess weight, motor had to be lighter than ordinary single-phase motors.

ROBBINS & MYERS custom-designed an 8 HP capacitor-start, capacitor-run motor that is daily proving its stamina against these rugged requirements. Should more power be needed, design includes provision for adding an auxiliary blower which can conveniently increase capacity to 10 HP. Weight was kept down by using special aluminum end heads. For easier maintenance, the extended end-head housing can be removed quickly and easily to expose condensers and centrifugal switch.

Many other features insure longer life for *every* R&M motor: double width bearings that have extra-large grease capacity . . . Mylar* insulation with 8 times the dielectric strength and 35 times more moisture resistance than ordinary paper insulation . . . removable caps for quick bearing inspection and relubrication . . . end heads that give full-height protection . . . dual-sweep ventilation for efficient cooling.

For motors to meet unusual challenges . . . and for standard motors, always contact ROBBINS & MYERS! Write today for Bulletin 470-PE

**DuPont registered trademark*

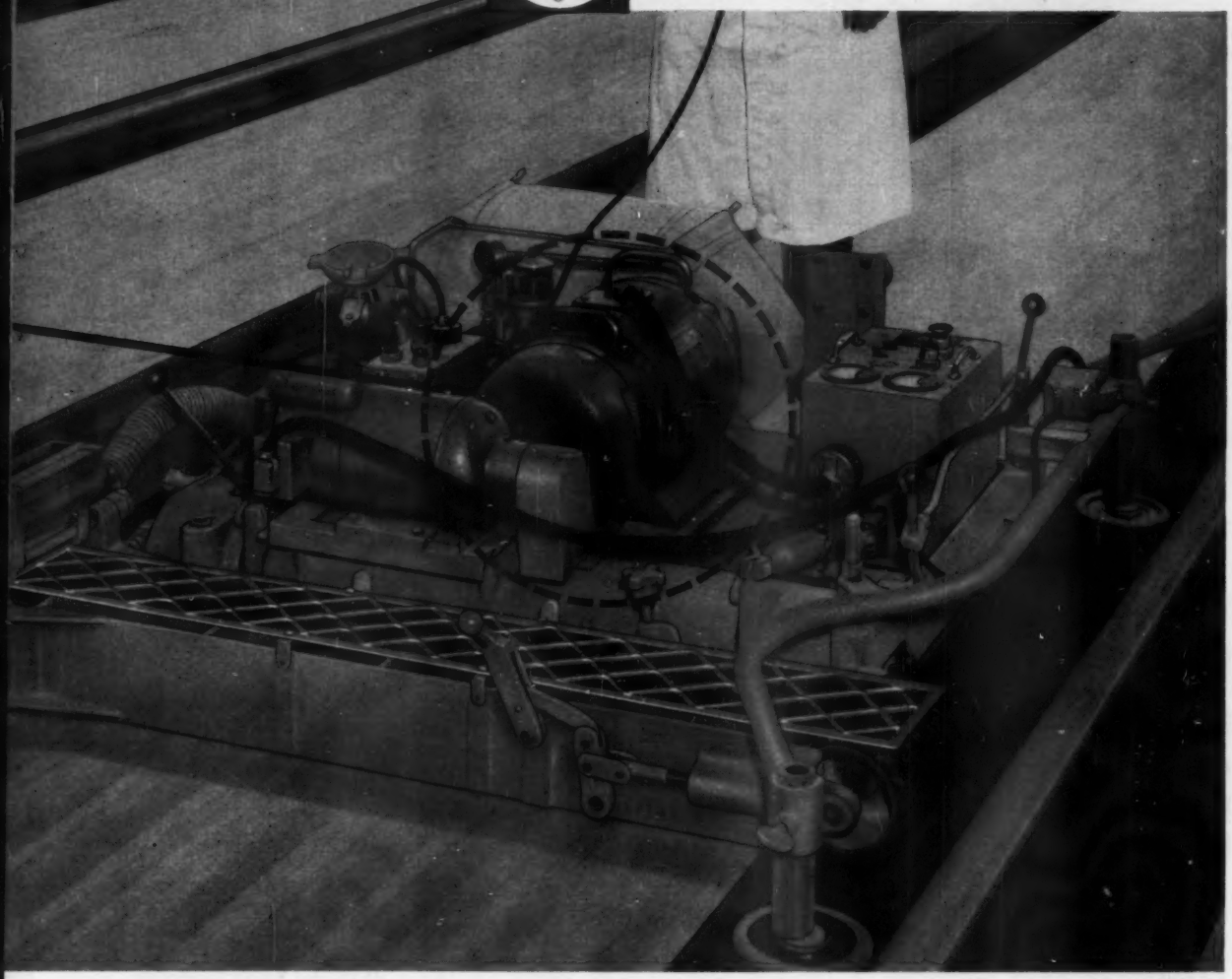
ROBBINS & MYERS, INC.

motors, household fans, Propellair industrial fans, hoists, Moyno industrial pumps

SPRINGFIELD, OHIO • BRANTFORD, ONTARIO

MOTORS 1 thru 200 HP

(other ratings 1/200 to 1 horsepower)

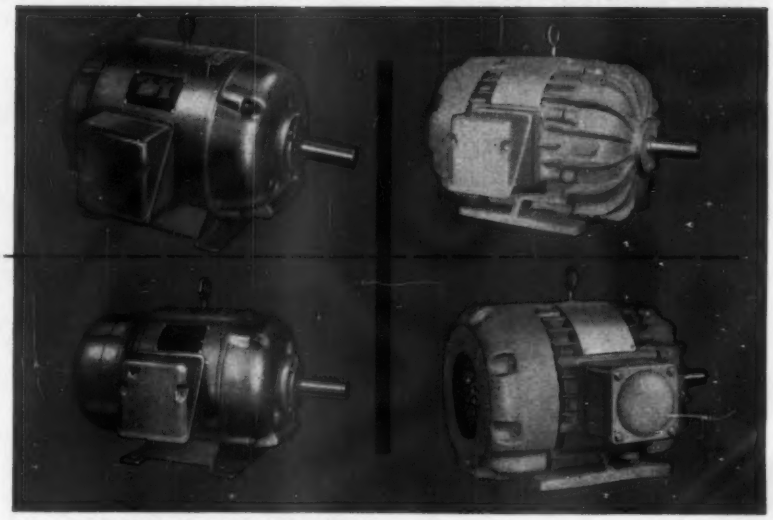


Open Protected Motors (left), up to 200 HP, are suitable for many applications formerly requiring totally enclosed construction.

Totally Enclosed Motors (right), ½ to 200 HP, are fan-cooled . . . offer complete protection against all harmful atmospheres.

"PM" Single Phase Motors (left), ratings through 20 HP, eliminate maintenance because they are fully weatherized for severe duty.

Explosion-Proof Motors (right), ratings through 200 HP, are Underwriters' Approved for Class I, Group D, and Class II, Groups F & G.



For more facts circle 517 on Reply Card

"WE RECOMMEND LUBRIPLATE FOR HENRY & WRIGHTS"

—says
The Hydraulic Press Mfg. Co.
A Division of Koehring Co.
of Mount Gilead, Ohio

"We have had excellent results with LUBRIPLATE in our new double crank design Henry & Wright Dieing Machines which we recently acquired from Emhart Mfg. Co., Hartford, Conn. This follows the same fine results Emhart had with LUBRIPLATE in single crank Henry & Wrights for many years. In the Operating Manual that goes with every new Henry & Wright machine, you will find that we recommend LUBRIPLATE."

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

For more facts circle 518 on Reply Card

BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Natural Gas Flame Cutting

PLANT ENGINEERING:

"I read with much interest the article on flame cutting with natural gas in your July, 1959 issue. Although we do not get into applications comparable to the one described in the article, we have at times been concerned with the comparison of cost between acetylene and natural gas on brazing and silver soldering operations.

"Our sources of information on the application of natural gas has been very limited. I am very much interested in obtaining sources of information on the application of natural gas to brazing and silver soldering operations. Do you know of any books or magazine articles that could be obtained for reference? Any information which you may be able to furnish will be sincerely appreciated." *W. C. Wheeler, Factory Engineer, Lennox Industries Inc., Marshalltown, Iowa.*

▶ The author of the article has indicated his willingness to answer specific questions on flame cutting with natural gas. We suggest readers write direct to him—Ray Fish, Bridge Shop Superintendent, Harnischfeger Corp., 4400 West National Ave., Milwaukee 46, Wis.—*Editors.*

Plant Engineers' Code

PLANT ENGINEERING:

"You may be interested in knowing that we've had orders for over 300 copies of the 'Code of the Plant Engineer' since publication of your very fine article about it in the October, 1959 issue of PLANT ENGINEERING.

"We know that these particular orders are a direct result of the article and we appreciate your calling this publication to the attention of your readers.

"I'm sure that the AIPE Code Committee joins me in thanking you for your interest." *Kay Buchanan, Administrative Secretary, American Institute of Plant Engineers, International Headquarters, Barrington, Ill.*

Quick Communications

PLANT ENGINEERING:

"We read an article in the August, 1959 issue of PLANT ENGINEERING, entitled 'Messages Send Maintenance Men to the Job—Directly,' by L. D. Garrison. We are interested in the Tel-Autograph and Instan-Form equipment that was mentioned. Can you please provide more information on this type of equipment." *R. D. Heintz, Engineering Dept., Eli Lilly and Company, Indianapolis, Ind.*

▶ This inquiry has been passed along to the Tel Autograph Co., Bellanca and Manchester Aves., Los Angeles 45, Calif.—*Editors.*

How Does Color Work?

PLANT ENGINEERING:

"I believe there have been articles in PLANT ENGINEERING from time to time concerning studies made, or actual experiences of various industrial companies, in the field of color dynamics, the effect of colors in improving productive efficiency and morale, and reducing fatigue, absenteeism and accidents.

"I would appreciate any leads you might have available to help me obtain such articles or reports." *John Marks, Plant Engineer, Permanent Filter Corp., Los Angeles, Calif.*

▶ In addition to sending several articles which we hope will be helpful, we have suggested that Mr. Marks write to E. I. du Pont de Nemours & Co., Inc., Finishes Div. Dept. PE-96, Wilmington 98, Del., for their booklet, "How To Put Color To Work," and to Pittsburgh Plate Glass Company, Paint Division, One Gateway Center, Pittsburgh 22, Pa., for further information.—*Editors.*

Polyurethane for Valve Insulation

PLANT ENGINEERING:

"I have read with interest the article entitled 'Polyurethane—Modern Tool' in the September, 1959 issue of PLANT ENGINEERING magazine.

"In-place foaming of polyurethane would appear to provide the ideal method of insulating a multiplicity of low temperature cooling solution valves. Water vapor will frequently penetrate more conventional hand molded insulation over odd-shaped valves and fittings, to freeze and split open the covering.

"Can you furnish me with the names of suppliers of polyurethane ingredients?" *C. Collar, Plant Engineer, Pabst Brewing Co., Newark, N.J.*

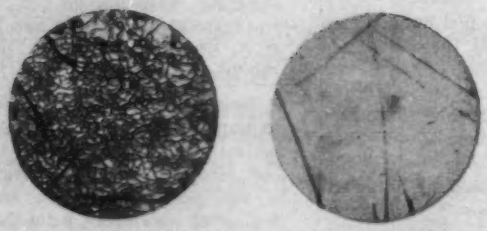
▶ Polyurethane foam certainly looks like the answer to this problem and we suspect that Nopco Chemical Co.,

Look for the label that assures WEATHER-RESISTANCE

When you see this label on a glass-fiber reinforced panel, you can stop worrying about how the panel will look after years of outdoor exposure. The label certifies that the panel is made with PARAPLEX P-444 acrylic-polyester resin, and means that the panel will show practically no discoloration or fiber evidence even after years of exterior use. The photomicrographs below show the difference, after 36 months, between test panels made with PARAPLEX P-444 and those made with conventional light-stabilized polyester resin.

Only panels made with PARAPLEX P-444, the Rohm & Haas acrylic-polyester resin, can bear this identification label. We will be glad to send you the names of manufacturers who use PARAPLEX P-444.

36-MONTH FLORIDA EXPOSURE TEST



Conventional light-stabilized resin | PARAPLEX P-444

Chemicals for Industry

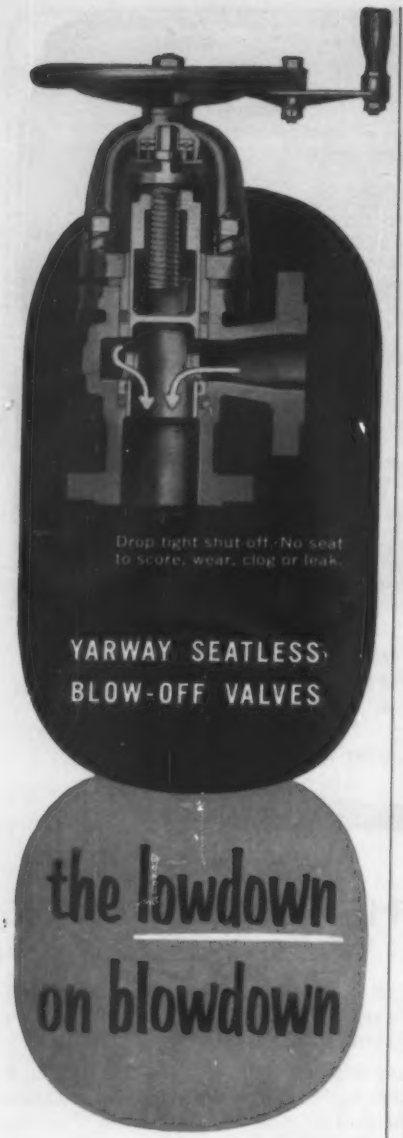
ROHM & HAAS COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

PARAPLEX is a trademark, Reg. U.S. Pat. Off. and in principal foreign countries.

PARAPLEX P-444

For more Facts circle 519 on Reply Card



Over 16,000 boiler plants depend on Yarway Seatless Blow-Off Valves. Pressures to 600 psi. Single or tandem combinations. For free Blow-Off Valve Book write YARNALL-WARING CO., 145 Mermaid Ave., Philadelphia 18, Pa.
Branches in all principal cities.

go YARWAY with confidence

For more facts circle 520 on Reply Card

BACKTALK— FORETHOUGHTS

in North Arlington, N. J., would be glad to run across town to talk with Mr. Collar about it.

Other suppliers in his area of the polymers for foaming polyurethane include the Thiokol Chemical Corp., 780 North Cunton Ave., Trenton; Baldwin-Ehret-Hill, Inc., 500 Breunig Ave., Trenton 2, N. J.; Witco Chemical Co., 122 East 42nd St., New York City; and Isocyanate Products Inc., 898 Wilmington Rd., New Castle, Del.—*Editors.*

Reference Material for Students

PLANT ENGINEERING:

"To better acquaint our industrial engineering students with the various types of material handling problems and their solutions, I am attempting to organize a laboratory for displaying equipment specifications, models, etc. In conjunction with the laboratory and our course in factory equipment layout, it is my desire to make available to the students appropriate reference material. I should appreciate your sending me an index to material published in your magazine." *Howell N. Foreman, Asst. Professor, Dept. of Industrial Engineering, School of Engineering, Southern Methodist University, Dallas, Tex.*

► Tear sheets and reprints are available generally for only 1958 and the current year. An index for 1958 is still available; that for 1959 is elsewhere in this issue.—*Editors.*

Reprints of Construction Cost Estimating Available

PLANT ENGINEERING:

"We wish to request you at this time to reserve for me a copy of your 'Construction Cost Estimating' currently appearing in PLANT ENGINEERING.

"From reading the first in the series, it is safe to say that this book is a must for all plant engineers who, like myself, have the job of submitting preliminary estimates to management on proposed new buildings, etc." *P. J. MacDonald, Plant Engineer, Davie Shipbuilding Ltd., Lauzon, Que. Canada.*

PLANT ENGINEERING:

"I will appreciate your reserving a copy of the reprinted articles on 'Construction Cost Estimating' by John Gilroy, as announced in your July, 1959 issue.

"Can you furnish tear sheets of the first installment on foundations? The article had been foully removed from the copy available to me before it reached my desk." *L.P. Morris, American Cyanamid Co., Bridgeville, Pa.*

PLANT ENGINEERING:

"Will you please reserve for us one copy of your booklet which is to be made up of reprints of a series, 'Construction Cost Estimating,' which is currently appearing in your magazine?" *Arthur H. Kuljian, Vice President, The Kuljian Corp., Philadelphia, Pa.*

PLANT ENGINEERING:

"Will you please reserve for me a copy of the articles 'Construction Cost Estimating,' as started in the July, 1959 issue of PLANT ENGINEERING. This series, as you have outlined it, should be very interesting and helpful and I think a very good idea." *P. E. Peterson, Plant Engineer, Chase Brass & Copper Co., Waterbury 20, Conn.*

PLANT ENGINEERING:

"Kindly reserve two copies of the booklet 'Construction Cost Estimating' for me. This data will be of great value to me and I am sure to countless others who have been searching for it for many years." *D. B. Barry, P. E., Plant Planning Engineer, Dominion Engineering Works Ltd., Montreal, Que., Canada.*

► Copies of this 11-article reprint will be available from the Editor at nominal cost after completion of the series in May, 1960.—*Editors.*

Waterproofing for Basement

PLANT ENGINEERING:

"We have in mind a building in which the basement has a concrete floor and stone masonry walls, where, during times of heavy rainstorms, water seeps through and collects perhaps to a depth of 1½ in. or so on the floor. Hence, it will be greatly appreciated if you could send us some data covering waterproofing of concrete and masonry surfaces." *Chas. H. Yost, P. E. Electrical Engineer, The Curtis Publishing Co., Philadelphia, Pa.*

► Best remedy, as we see it would be to install porous drain tile around the perimeter of the basement to catch and remove seepage. However, if this is not practicable, there are many brands of waterproof paint that could be applied, preferably, of course on the outside. It is possible to use a grouting to prevent seepage and this can be applied from the surface through probes, without digging out around the entire foundation.—*Editors.*

For more facts circle 521 on Reply Card →

New!

Allen-Bradley Bulletin 700 Type BR Relay with Easily Convertible Contacts

Bulletin 700 Type BR relay with four poles arranged for normally open contact operation.

Changeover made in seconds!

The contacts of the new Type BR relay can be arranged for either normally open or normally closed operation—and any changeover in the field can be made in seconds. A screwdriver is all that's needed.

Sets new standards in mechanical life and contact reliability!

This all-new addition to the A-B line of Bulletin 700 control relays has been designed to keep pace with the developments and progress in modern industry. The Type BR relay particularly satisfies the requirements of modern automatic machines where the control functions must be altered frequently to meet new and changing production requirements.

Quick and easy convertibility of the Type BR contacts from normally open to normally closed contacts —or vice versa—enables "on-the-spot" changes. Such built-in contact flexibility of the Type BR relays can be used to reduce relay inventories.

Exhaustive laboratory and field tests have indicated that the new A-B Bulletin 700 Type BR relays will establish new standards for the mechanical life and contact reliability for this general class of industrial relay.

Another great convenience for the user lies in the fact that a convertible auxiliary contact can be added to either or both sides of the Type BR relay—having full switching capacity—without disturbing the wiring or removing the relay. These auxiliary poles are easily mounted from the front.

Of course, all Type BR relays have double break, silver alloy contacts that never need attention. The cast-plastic coil is impervious to the most severe atmospheric conditions.

Please write for full details on this latest addition to Allen-Bradley's line of *quality* industrial relays, today!

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

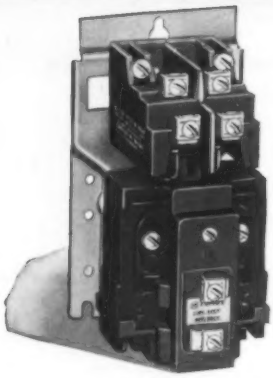
ALLEN-BRADLEY Member of NEMA — **QUALITY MOTOR CONTROL**

10-59-MR

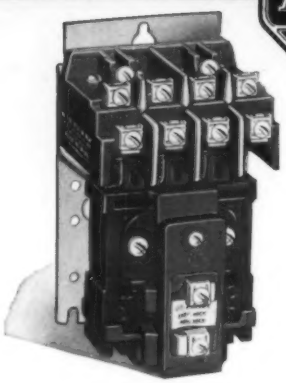
NEW Allen-Bradley Bulletin 700 Type BR RELAYS

are available with from two to eight poles— all with contacts *easily convertible* from N. O. to N. C.

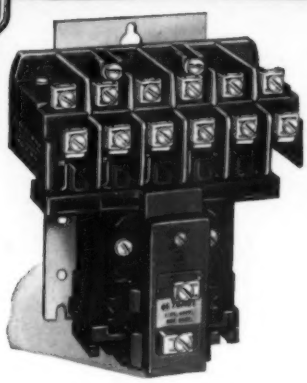
A-B QUALITY



Two Pole Construction



Four Pole Construction



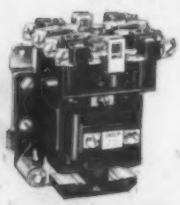
Six Pole Construction

Two extra convertible poles can be easily added—in the field

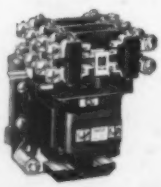
An auxiliary convertible contact pole—having full switching capacity—can be easily added to the left and right sides of the Type BR relays. These auxiliary poles are front-mounted and can be added without disturbing the wiring of the relay—and without removing the relay. All relays are designed to also accept stab connectors, and—all terminals are accessible from the front.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis. In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

Other popular Allen-Bradley industrial relays



Improved Bulletin 700 Type B
General purpose relay made with up to 8 poles.



Improved Bulletin 700 Type BX
Universal relay with both N.O. and N.C. contacts.

More mechanical life—greater contact reliability

10-59-MR

ALLEN-BRADLEY

Member of NEMA

Quality Motor Control

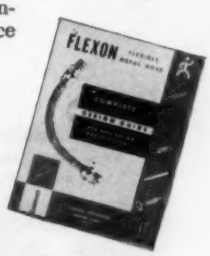
METAL HOSE to absorb any motion... meet all pressure, temperature, and fluid needs

Flexonics capabilities and experience in meeting the full range of piping problems—from the simplest to the most drastic—is without equal. Whether your requirements involve one or any combination of motion, pressure, corrosion, temperature, or fluid factors, Flexonics will quickly meet the challenge.

Note in the photo above how flexible hose absorbs shock loads while it solves a misalignment problem in the lines of a press at Kropp Forge Company.

The complete Flexonics standard line of metal hose will provide you the construction, material, and size (3/16" to 24" I.D.) that the job demands. Your special engineering requirements are more readily met by Flexonics vast facilities—enjoying a record of outstanding service to every segment of industry.

METAL HOSE DESIGN GUIDE
Write for your free copy . . . a must for your reference file.



IH-359

TOMORROW'S ENGINEERING TODAY

Flexonics
INDUSTRIAL HOSE

FLEXONICS CORPORATION • 1340 SOUTH THIRD AVENUE • MAYWOOD, ILLINOIS

Divisions
INDUSTRIAL HOSE • EXPANSION JOINT • BELLOWS • AERONAUTICAL • AUTOMOTIVE
Flexonics Research Laboratories, Elgin, Illinois
In Canada: Flexonics Corporation of Canada, Limited, Brampton, Ontario

For more facts circle 522 on Reply Card

J-M Marinite...

Here's how

Now construct your own ovens *in your shop* with efficient, easy-to-work Johns-Manville Marinite.

fast, new way to oven economy

. . . easy to fabricate . . . easy to maintain . . . builds and insulates in one operation

If downtime and costs are delaying needed oven changeovers—or installation of new ovens—in your plant, here's big news: Johns-Manville Marinite, made of asbestos and diatomaceous silica, can show you the way to build your own high-efficiency oven *in your own shop* at low cost.

Get these important savings

When you build your oven with Marinite, you eliminate the need for linings and outer facings, because Marinite is *both* an efficient insulation *and* a structural board. Your shop can prefabricate oven panels from large 4' x 10' sheets with standard saws and drills—assemble them quickly with a minimum of structural support.

Cut maintenance to the minimum

Marinite ovens last indefinitely with little or no maintenance. Made of asbestos fiber, diatomaceous silica and an inorganic binder, Marinite never rusts, rots or corrodes . . . is completely unaffected by moisture condensation during cyclic shutdowns. A rigid, homogeneous material, Marinite eliminates "hot spots" caused by soft insulations that settle and sag in service.

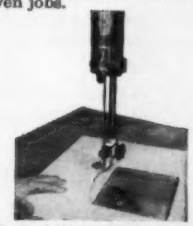
Change over with Marinite now for new oven efficiency

Don't put off your oven changeover another day. With Marinite's low conductivity, you can add new efficiency to your oven at unmatched low cost. And you'll find Marinite cuts heat loss so effectively that areas directly adjacent to ovens become usable, comfortable work areas.

Marinite now carries Underwriters' label

Marinite-23, 36, and 65 now carry Underwriters' Laboratories label for: *zero* flame spread; *negligible* fuel contributed; *zero* smoke developed (based on 100 for untreated red oak). For information write Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

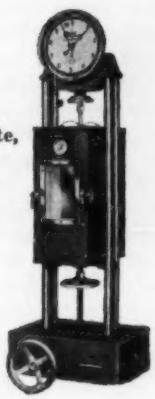
Large Rigid Sheets, up to 4' x 10' make Marinite the ideal material for the largest oven jobs.



Workability of Marinite can help you cut oven costs downtime by fabricating and assembling your own ovens.

W. C. Dillon & Co. uses Marinite for easy assembly and close temperature control

W. C. Dillon & Co., Inc., Van Nuys, California, makers of scientific instruments and temperature control cabinets for materials testing, uses Marinite to maintain precise temperature *and* to present a clean, trim appearance. "We would certainly recommend Marinite to any concern interested in *cutting costs and in producing a fine piece of finished equipment,*" says Robert E. Dillon, V. P.



Made of Marinite, Dillon cabinets maintain precise temperatures for materials testing.

JOHNS-MANVILLE JM PRODUCTS

JOHNS-MANVILLE
Insulations
FOR LASTING THERMAL EFFICIENCY

For more facts circle 523 on Reply Card

PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Anchoring a New Roof to Old Masonry

WHEN A CONCRETE hangar at the Oceana, Va., Naval Air Station was recently reroofed with built-up

Furring strips are anchored to old concrete roof with expansion bolts.

smooth surface asbestos over felt insulation, the contractor cut time and material costs by fastening asbestos roofing to 1 by 6 pine furring strips between which the felt insulation was laid. The furring was anchored solidly to the old concrete roof by drilling holes right through the strips into the concrete, then hammering home one-piece expansion bolts. Anchoring the furring, laying insulation, and roofing the area of 80,000 sq ft was completed in four months.

Made of high-grade "steel with a memory," the expansion bolts are heat treated for tensile strength and hardness and then pre-expanded. Driven into a hole in concrete, the bolt tries to regain its bulged shape, exerting expansion forces on the sides of the hole. *From a release of The Rawlplug Company Incorporated, New Rochelle, N. Y.*

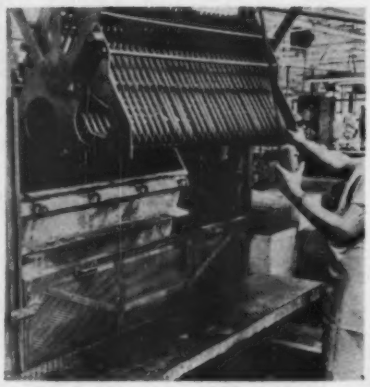
Curtain Protects Men, Machine

A GLASS FIBER CURTAIN is catching blue-hot chips from a boring mill at Allis-Chalmers Manufacturing Co. in Milwaukee. Chips and sparks from a turbine housing, 13 ft diam, are deflected harmlessly to a conveyor and are moved by the conveyor into tote boxes

The curtain, 14 ft wide and 30 ft high, is raised and lowered by air-motor which is synchronized with the travel of the head on the boring bar. This protects not only tool-ways, spindles, rams, cross rails, etc., but also prevents hot chips from striking workmen. *From a release of A & A Manufacturing Co., Inc., Milwaukee, Wis.*

Barrel Finishing Technique Adapted

PRECISE BARREL finishing techniques have recently solved a costly problem for American Machine and



Specially-designed fixtures hold tracks in barrel during finishing process.

Foundry Co., saving the concern $37,000 a year in the manufacture of its automatic pinspotter unit.

The pinspotter had developed an isolated problem spot. Source of the trouble was a nylon gear which wore out too quickly.

The nylon gear was checked where it meshed with the cast teeth of the distributor track. The surface finish of this track met commercial standards for smoothness, but still had microscopic rough spots. These imperfections, wore away the gear at a faster than normal pace.

Improving the track finish by usual methods required about 70 min for each track, so a machine with a special fixture was designed in which the abrasive medium flows around the part. Tracks can now attain a 32-microinch finish at a rate of 10 min each.

In the first year of use, the new machine paid for itself and saved an additional $24,000. *From a release of Almco, Queen Products Div., King-Seeley Corp., Albert Lea, Minn.*

P.E.'s Design Milling Equipment

CAPABILITIES in chemical milling have been broadened in our company with the recent addition of a 6400-gal caustic tank and an automatic control device for taper milling of aluminum parts. A hydraulically-operated lift, suggested by our engineers and built to plant engineering specifications, allows the number, depth and rate of dips into the solution to be controlled with extreme accuracy.

The tapering tank, 14 ft long and 4 ft wide, is sunk 15 ft into the shop floor. Heated to between 195 F and 205 F, the caustic solution is agitated constantly by streams of compressed air forced into the bottom of the tank.

Fumes from the tank are re-

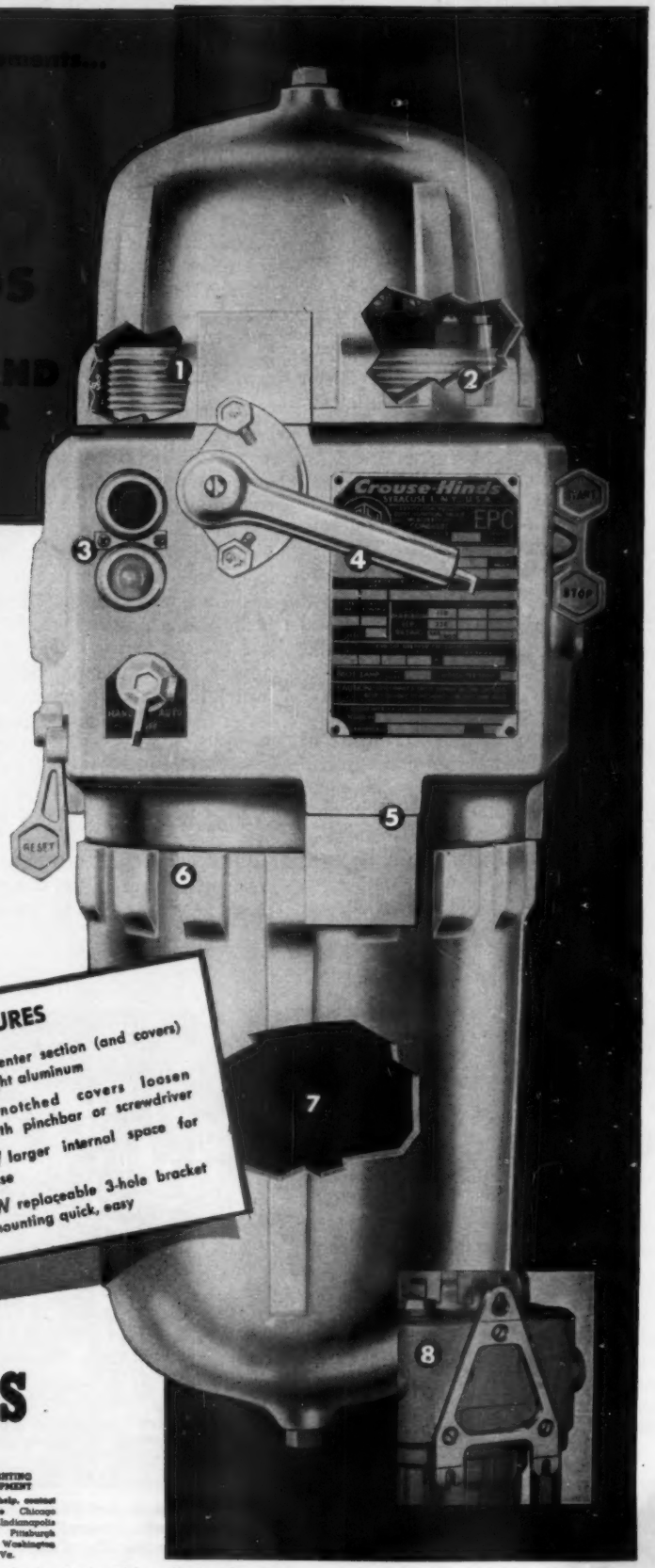
Hydraulic system controls immersion time and depth, shuts off automatically.

moved by a separator located under the tank. Pulled off the top of the solution, the fumes are washed thoroughly and blown free through outside stacks.

(Continued on page 40)

Now with 8 important improvements...
at no increase in price

New EPC CROUSE-HINDS EXPLOSION-PROOF MOTOR STARTER AND CIRCUIT BREAKER



The latest refinement in a long-tested, proved and improved explosion-proof combination Motor Starter & Circuit Breaker, this new Crouse-Hinds Condulet® EPC-M59 brings you tomorrow's convenience, dependability and safety at yesterday's prices.

Designed to conform with the National Electrical Code requirements for Class I, Groups C and D; Class II, Groups E, F and G; and Class III, it provides for built-in breathers and drains . . . built-in push-button stations, selector switch and pilot lights . . . seven taper-tapped conduit entrances . . . starter below breaker for safe, easy maintenance . . . compact design to permit a greater number of controls in any given area.

Now available in 7" and 9" sizes for Sizes 1 and 2 starter combinations. For more detailed information consult your Crouse-Hinds distributor, or any of the offices listed below.

ALL THESE NEW FEATURES

1 NEW raintight joints for both top and bottom covers

2 NEW shoes and guidance slot for easier interior assembly mounting

3 NEW built-in pilot lights available where visual indication desired

4 NEW easier-to-lock breaker handle (takes up to 3 padlocks)

5 NEW center section (and covers) of lightweight aluminum

6 NEW notched covers loosen quickly with pinchbar or screwdriver

7 NEW larger internal space for wiring ease

8 NEW replaceable 3-hole bracket makes mounting quick, easy

CROUSE HINDS

MAIN OFFICE AND FACTORY: SYRACUSE, NEW YORK
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.
Crouse-Hinds Instrument Company, Inc., Silver Spring, Maryland

• CONDULET® ELECTRICAL EQUIPMENT (Explosion-Proof and Conventional) • FLOODLIGHTING
• TRAFFIC CONTROL SYSTEMS • AIRPORT LIGHTING and WEATHER MEASURING EQUIPMENT

These products are sold exclusively through electrical distributors. For application engineering help, contact one of the following offices: Atlanta Baton Rouge Birmingham Boston Buffalo Charlotte Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Omaha Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul Salt Lake City San Francisco Seattle Tulsa Washington
Resident Representatives: Albany Baltimore Reading, Pa. Richmond, Va.

For more facts circle 524 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

When parts are racked, blocks are set on the hydraulic lift to control the length of the dip and the height to which the rack is lifted out of the solution. The rest of the operation is pushbutton. *From The Beechcrafter, published by Beech Aircraft Corp., Wichita, Kansas.*

Try These Water-Saving Tips

SEVERAL IDEAS to reduce wastage of water at our general purpose control department in Buffalo, N.Y., resulted in a savings of more than 15,000,000 gal of water per year. Water savings not only cut costs and provided the community with more water, but eliminated occasional shutdowns due to low water pressure.

For example, large quantities of water are used in the plating room. During lunchtime, it was impractical to shut off water at each tank because of the great number of tanks involved. Therefore, an electrically-timed, air-operated valve was installed on the four-inch water main which supplies all water for plating operations. Now, water is automatically shut off, and this idea resulted in a saving of 4,000,000 gal of water per year.

Another 2,620,000 gal of water were saved annually by using a control unit, called Solu-Bridge controller, on the rinse tank of the horizontal barrel cadmium line. The controller maintains the rinse tank at high purity without a full-flow water line by having a solenoid-operated valve controlled by the conductivity of the water. In the rinse tank, as the cadmium salts build up to an undesirable level, the conductivity increases sufficiently to activate the solenoid. The valve opens and water flows to reduce contamination.

In addition, a saving of 3,700,000 gal of water per year resulted from back-flowing water from the acid rinse tank into the alkali rinse tank. The acid neutralizes the alkali and thereby improves the effectiveness of the alkali tank. Simultaneously, this eliminates the continuous water flow into the alkali rinse tank. *From a release of Westinghouse Electric Corp., Pittsburgh, Pa.*

Treated Water Suits Fish Fine

OUR REFINERY at Bronte, Ont., welcomes visitors to its water treatment plant, where, to show that the refinery water has been properly treated, an aquarium houses several varieties of Lake Ontario fish.

Fish swim in aquarium supplied with treated effluent water from refinery.

The aquarium is constructed of free standing, reinforced concrete, floating on four columns which also support the umbrella roof. The exterior is composed of mosaic tile, while the interior walls are coated with non-toxic paint.

Effluent water from the refinery which has been properly treated supplies the aquarium. It does not injure the fish or aquatic plants. The water, which on the average is changed six to 10 times daily, enters and leaves the aquarium through the columns. Water is held between 45 and 55 F, by passing it through a heater or refrigeration unit. After being used in the aquarium, treated effluent is either returned to a sand filter for reclarification, or is pumped into Lake Ontario. *From a release of Cities Service Research & Development Co., Inc., New York, N. Y.*

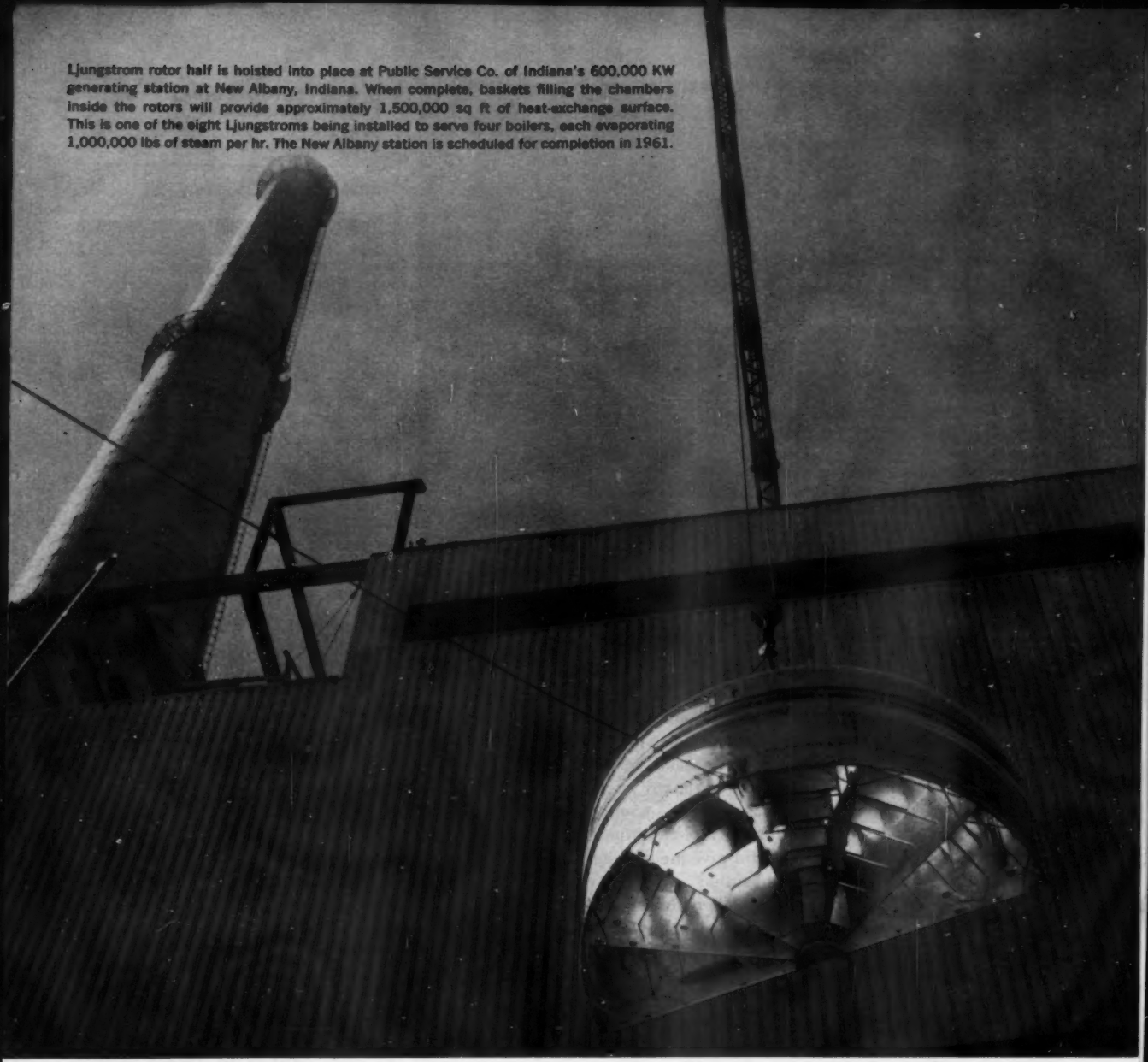
Saving Steps for Maintenance Men

Sub-storeroom in Melt Shop has eliminated many trips to and from main storeroom for spare parts and stores used regularly. Plastic covered tags identify various items. (From a release of Timken Roller Bearing Co., Canton, Ohio.)

Vinyl-Based Coating Takes Hard Wear

COVERED HOPPER CARS, built to haul such materials as cement, bauxite, soda and potash, are being protected to withstand the effects of chemicals and weathering, with a vinyl coating, at Pullman-Standard Manufacturing Co., Butler, Pa. The paint, made by Pittsburgh Plate Glass Co., Pittsburgh, Pa., is based on Bakelite vinyl resin.

Car surfaces are first shot-blasted



Ljungstrom rotor half is hoisted into place at Public Service Co. of Indiana's 600,000 KW generating station at New Albany, Indiana. When complete, baskets filling the chambers inside the rotors will provide approximately 1,500,000 sq ft of heat-exchange surface. This is one of the eight Ljungstroms being installed to serve four boilers, each evaporating 1,000,000 lbs of steam per hr. The New Albany station is scheduled for completion in 1961.

BEHIND NEW ALBANY'S **LJUNGSTROMS®** —LIFETIME AIR PREHEATER SERVICE

One of the major reasons why Public Service Co. of Indiana, Inc., chose Ljungstrom for its new generating station at New Albany is Lifetime Air Preheater Service.

Lifetime Air Preheater Service means that Ljungstrom engineers make regular calls *throughout the life of each unit.* They check to make sure your Ljungstroms are working at top efficiency, and that they'll continue to work that way. This service policy covers all Ljungstroms—right from the very first installation made in 1923.

But that's not all. Air Preheater provides first-rate *emergency* service, too. For instance, a Ljungstrom customer in the southwestern U.S. recently called on a Wednesday night for replacement parts. Air Transport looked like the fastest way, but schedules indicated a minimum three-day delivery time. So Air Preheater loaded the parts on a pickup truck, and their men drove them more than 1,000 miles to their destination...34 hours straight driving. The parts were installed and in service by Friday morning.

Fast response to emergencies and regular inspection of Ljungstrom installations are two of the many advantages Air Preheater provides. Another is expert knowledge of boiler and preheater problems gained from over 35 years' experience. Perhaps these reasons explain why 9 out of 10 preheaters sold today are Ljungstroms.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

For more Facts circle 525 on Reply Card

"6 MEN OUT AGAIN TODAY?" "WHY?"

"I was on the receiving end of that question. And I knew what the boss was driving at. Production-wise, we couldn't stand our current rate of absenteeism. Even the men on the job were dragging their feet. To show you what I mean: we had just lost one of our best customers. Reason: one too many late shipments.

"Logically, when sickness strikes, you consult a doctor. Which is what I did. Without actual examinations, he couldn't diagnose the trouble. But he did give me the clue when he asked, 'How are your working conditions?'.

"Frankly, our plant is dirty. Or better put, dusty. With grinding machines running 24 hours a day, how could it be anything else? With that thought, I remembered. A salesman had been in my office just the other day talking about dust. I had too many production headaches at the time to hear him out. But I kept his card. So I called him back.

"He was from Torit. He was selling Torit Dust Collectors . . . machines that trap dust. When I compared the low cost of his equipment with the high cost of our production lag, I decided it was worth a try. So I bought one . . . just one, to start, for $285.00. We installed it ourselves on a key machine.

"The change in the man operating that machine sold me. Within a month, we had a Torit Dust Collector system attached to seventeen dust-producing machines in the plant. As a result, the air in our plant is clean, the way it should be. Our absentee rate is no longer a problem. Our production rate is at top speed. And you know something? I feel better myself!"

Is dust doing you *dirt? For complete facts on dust damage . . . and how to control it . . . write:*

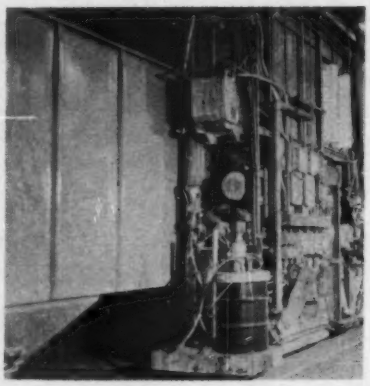
TORIT manufacturing company

Dept. 1811, 1133 Bankin Street, St. Paul 16, Minnesota

For more facts circle 526 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)



Automatic spray system applies vinyl paint to the hopper cars for protection against weather and chemical damage.

to remove old scale and dirt, then a red lead primer is hot sprayed. This is followed in less than 45 minutes by two hot spray, gray finish coats. The hot spray application is made at temperatures between 140 and 150 F. The high temperature permits the paint to dry quickly and eliminates the need for a thinner. There is no extended waiting time for cars to dry because the system usually sets up by the time the painted car is ready to leave the maintenance shop. *From a release of Union Carbide Plastics Co., New York, N.Y.*

Extraction Unit Moved on Remotely-Steered Dollies

AN OTHERWISE simple erection job sometimes necessitates the taking of major steps to eliminate potential explosion hazards.

This was the case when engineers installed a new continuous solvent extraction unit at the Clinton, Iowa, plant of Clinton Corn Processing Co., Div. of Standard Brands Inc. To eliminate the hazards of welding and constructing a new extractor while maintaining vital operations in the existing facilities where hexane is used as a solvent, the extractor parts were assembled and welded together outside the new addition to the oil extraction building. They were moved as a unit into the structure.

To facilitate the subsequent mov-

Why a Steam Trap Has to Handle "Air"

Low temperatures and corrosion of equipment are often evidence of inadequate trap air venting capacity

Air, with its load of oxygen and carbon dioxide, has an unwholesome habit of interfering with the efficiency of steam heated units. If steam were always free of these undesirable companions, things would be a lot simpler for men-who-operate-plants. Because it isn't, three unhappy situations frequently occur:

1. ***Operating temperatures are subnormal.*** This is a two-part problem. First, an air-steam mixture has a lower temperature than pure steam at the same pressure—see Table A. Secondly, air can "plate out" on heat transfer surfaces as shown in Figure 1. Under some conditions, such an air film will knock down heat transfer efficiency by as much as 50%.

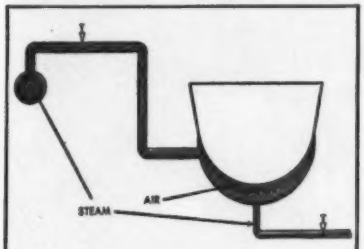


Fig. 1. *How air can "plate out" on heat transfer surfaces. This "insulation" drastically reduces heat transfer efficiency. Armstrong trap operation creates turbulence in the equipment that prevents this.*

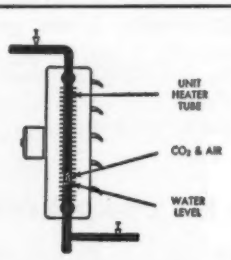


Fig. 2. *Corrosion occurs when units are not kept continuously free of both condensate and air. Armstrong traps discharge both,* at steam temperature, *as fast as they accumulate.*

2. ***Corrosion rears its ugly head.*** Oxygen and carbon dioxide are real trouble-makers. CO_2 gas goes into solution in condensate, forms carbonic acid and chews away at vulnerable metal sections. O_2 aggravates situation. See Figure 2.

TABLE A—How air reduces steam temperature.

Gauge Pressure	Temp. of Steam with No Air Present	Temp. of Steam Mixed With Various Amounts of Air (% Air by Volume)	
		10%	30%
10.3	240.1	234.3	220.9
25.3	267.3	261.0	246.4
50.3	298.0	291.0	275.1
75.3	320.3	312.9	295.9
100.3	338.1	330.3	312.4

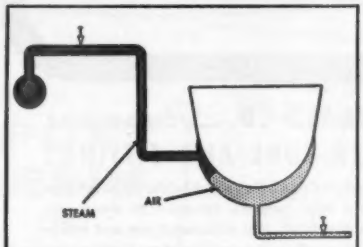


Fig. 3. *When steam is turned on, it takes a trap with extra air venting capacity to provide fast heat-up.*

3. ***Heat-up is slow as a snail.*** Air has a picnic in units that are shut off periodically. Figure 3 pictures the problem. Lines and equipment literally fill up with air. When the steam is turned on it can get in only as fast as the air gets out.

Enter Steam Traps

Curing these steam system ailments involves an operation sometimes called a "trap transplant." It consists of removing traps that don't get the air out and replacing them with traps that do.

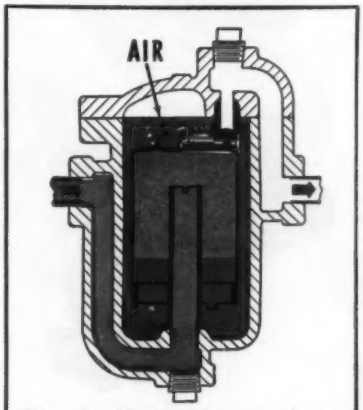
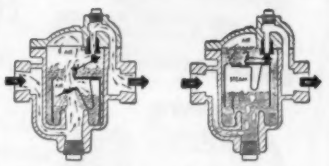


Fig. 4. *Air entering an Armstrong trap passes through the bucket vent and accumulates in the top of trap. When trap opens, air is discharged along with condensate.*

Figure 4 shows how an Armstrong inverted bucket trap continuously vents air. What the picture doesn't show is a built-in plus-value of this trap's design. An Armstrong trap opens suddenly, creating a momentary pressure drop and turbulence in the unit being drained. This breaks up air films and "pumps" air down to the trap so it can be vented.

The vents in standard Armstrong trap buckets will pass all the air normally encountered. In special cases, such as paper machine dryers, the vents are correctly sized larger at the factory to meet the requirement.



Thermostatic vent open. *Thermostatic vent closed.*

Fig. 5. *Open float with thermostatic vent for off-and-on units. When trap is cold, vent is open, permitting air to blow through when steam is turned on. When steam reaches trap, heat closes thermostatic vent. Then, regular bucket vent handles all air coming in with steam.*

Open Float with Thermostatic Vent

Super air-venting capacity is a must for fast heat-up of low pressure unit heaters, heating coils, steam headers and other units that are on-and-off. Figure 5 shows how the Armstrong open-float-with-thermostatic-vent trap takes care of this.

* * *

The 44-page Armstrong steam trap book covers other features of the Armstrong trap as well as its excellent air handling characteristics. This catalog also discusses trap selection, installation and maintenance. Your local Armstrong Representative or Distributor will be glad to give you a copy. Call him, or write Armstrong Machine Works, 9123 Maple Street, Three Rivers, Michigan.

ARMSTRONG STEAM TRAPS

See Our Catalog in Sweet's Plant Engineering File
For more facts circle 527 on Reply Card

You Can Get Everything
for every kind and type of
INDUSTRIAL PIPING SYSTEM
From *ONE* Dependable Source

MUELLER BRASS CO. *Streamline*
COPPER TUBE AND FITTINGS

Streamline Copper Tube and Solder-Type Fittings make a tight, sanitary system with clean, unobstructed joints that withstand jars and vibrations. Streamline tube and fittings are lightweight, (longer lengths can be conveniently handled, eliminating many fittings); resist corrosive acids, clogging, will not rust. Products available include K, L, M and DWV copper tube as well as both cast and wrought solder-type fittings in a complete range of sizes.

MUELLER BRASS CO. PVC
RIGID PIPE AND FITTINGS

PVC for industrial piping withstands shock, impact, vibration and twisting; can be used at higher pressures than other similar materials. PVC resists corrosive action of water, oil, alkaline or salt solutions, gases and a wide variety of acids. Economical, lightweight, PVC is fabricated in 20′ lengths; ½″ through 3″ sizes.

MUELLER BRASS CO.
VALVES OF ALL TYPES

Streamline valves are ruggedly designed and built to give years of trouble-free service. They are made of non-porous, cast red brass and all working parts are precision machined for perfect alignment of seating surfaces. Positive sealing is further assured by tough composition discs. Complete range of sizes and styles includes compression stops, gate, globe and swing check valves, boiler drains and sill cocks.

Write today for complete information on Mueller Brass Co. products for any industrial piping system.

282

MUELLER BRASS CO.
PORT HURON 52, MICHIGAN

For more facts circle 528 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

ing operation, a temporary foundation was provided for assembling operations by filling 50 gal drums with concrete. All the sections were then positioned on these supports and welded together. When the 40-ton, 14-ft high by 24-ft diam unit was completely assembled, it was lowered by hydraulic jacks onto four heavy 8-wheel dollies designed for remote control steering.

A heavy cable attached to the mobile unit and leading through building openings to a truck-operated winch on the opposite side completed the rigging setup. Completion of the move consisted of pulling the extractor into the building, maneuvering it into position, and elevating it sufficiently to receive its 7-ft high permanent supports. *From a release of Blaw-Knox Co., Chemical Plants Div., Pittsburgh, Pa.*

Solvent extraction unit, assembled out doors, rests on remotely-steered dollies, ready to be moved into building.

Rig for Heat Exchanger Maintenance

THERE USED to be two ways of cleaning heat exchangers in our refineries: rig temporary hauling lines and winch and jack the tube bundle into a crane sling; or build an expensive, permanent steel structure, complete with overhead monorails and hoists. In either case, pulling and inserting a bundle usually took eight to 10 men three or four hours to do the job.

Designers in the engineering department looked for a way to reduce the expense of this operation and as

It's NEW!

SMOOTH-ON'S ALUMINUM

METALSET® A4

EPOXY RESIN IN TUBES!

Advantages of METALSET® A4

- No solvent to cause shrinkage
- Hence, use it in *any* thickness, all at one time
- Adhesive: to steel, iron, aluminum, glass, and all porous materials like wood and ceramics
- Hard: can be drilled and tapped
- Stable: waterproof, oilproof, chemically resistant
- Flexibilized against thermal and mechanical shock
- Not only is revolutionary epoxy-resin cement easy to use:—Metalset A4 is non-flammable, hardens at room temperature, and is made with minimum-toxicity materials only

Just squeeze equal lengths from each tube. Mix. Use. Take only what you need. Keep what's left for the next job.

Typical Applications

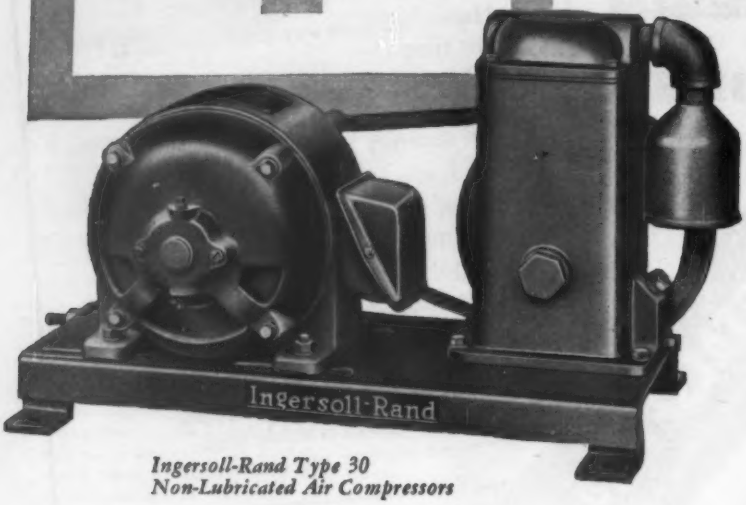
- Stops leaks in pipes, tanks, concrete
- Bonds metal to metal, wood, concrete
- Smooths and fills dents in sheet-steel and aluminum
- Sets loose parts tight
- Caulks windows, roof fixtures, sidewalk elevators

METALSET®

Made by Smooth-On Manufacturing Company • *Established in 1895* • 572 Communipaw Avenue, Jersey City 4, N. J.

For more facts circle 529 on Reply Card

clean,
oil-free
compressed air



Ingersoll-Rand Type 30
Non-Lubricated Air Compressors

For applications requiring oil-free air, Ingersoll-Rand's Non-Lubricated Compressor is the economical answer. These I-R compressors are in wide use in dairies, breweries, distilleries, chemical and food plants.

These Non-Lubricated Compressors are designed with the compression cylinder separated from the crankcase by a cast-in wall and a special seal . . . available bare, baseplate or tank-mounted.

For complete data, write today.

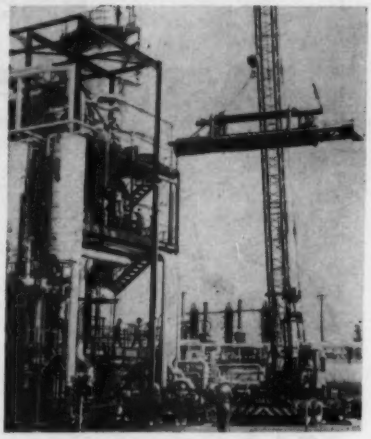
Ingersoll-Rand

3-805 11 Broadway, New York 4, N. Y.

For more facts circle 530 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)



Crane lowers extractor and bundle.

a result, designed a portable, power-driven mechanical tube bundle extractor that could be handled with a yard crane. The extractor removes a heavy tube bundle from its shell and lowers it to the ground—anywhere from 20 ft to 60 ft—with minimum effort.

The equipment is a light, welded apparatus that can be slung from an ordinary 25-ton yard crane. It can handle bundles up to 36 in. diameter and has sufficient pulling power to remove bundles tightly stuck in the exchanger shells. With it, three men can put a bundle into an elevated exchanger in about 40 minutes with a saving of almost $200 for every bundle handled. Our new Irving refinery will be using an extractor which can handle bundles up to 48 in. diameter and weighing 14 tons. *From the Standard Oiler, published by the Standard Oil Co. of California, San Francisco, Calif.*

Low-Maintenance Building

AFTER FIRE destroyed the timber frame building of the F. S. Royster Guano Co., South Norfolk, Va., the company rebuilt the warehouse, incorporating into it flame-resistant corrugated asbestos cement siding and roofing and panels of translucent fiber glass.

The new building is practically maintenance-free. The skylights and curtain wall glazing let in plenty of natural light, reducing the need for

Change hats
with your maintenance man . . .

You'll find out . . .

Vertical Lift Metal-clad Switchgear's mechanism is up front for easy access

Change places for a moment with the man who maintains your metal-clad switchgear. You'll probably discover you prefer—as he does—to work with General Electric Vertical Lift Metal-clad.

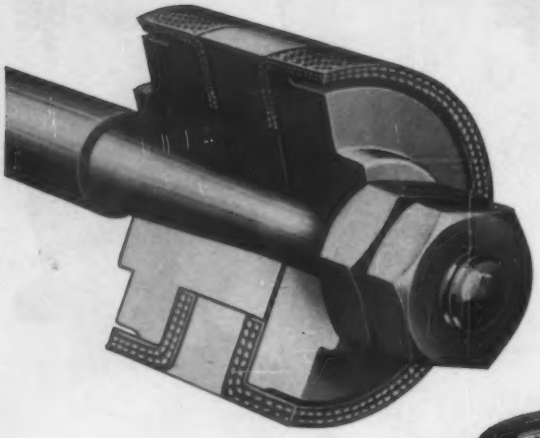
One big reason . . . Vertical Lift is the only metal-clad which has the breaker operating mechanism right up front where it's easy to get at. Unlike designs which locate the mechanism under the contacts, the G-E mechanism can be exposed for inspection in less than a minute. Vertical Lift saves your maintenance crews time, saves your company money. General Electric Company, Schenectady 5, New York. 511-35

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 531 on Reply Card

LESS FLUID SLIPPAGE!
LESS DOWNTIME!
GREATER EFFICIENCY!



...in hydraulic and pneumatic mechanisms, reciprocating pumps

Darcova Pumcup

Darcova 45° Bevel Type Pumcup

THE BIG DIFFERENCE you'll find in Darcova Pumcups is that they operate at full efficiency *throughout their entire life.* This means fluid slippage is virtually eliminated.

And because fewer replacements are necessary, you have less downtime. Users report that Pumcups *outlast ordinary packings at least 3 to 1!*

Pumcups are available in three textures—hard, medium and soft. Also in regular or 100% nylon composition. Sizes range from ¾" to 20". For all the facts on Pumcups, write for Bulletin 5903.

DARLING VALVE & MANUFACTURING CO.
Williamsport 14, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP

TRADE MARK
PUMCUPS

For more facts circle 532 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

Fiber glass skylights and curtain wall glazing allow natural light to enter plant, need no painting or refinishing.

artificial light and since the panels are tinted, they require no painting or refinishing.

Installation of the fiber glass panels in combination with corrugated asbestos was efficient and economical, as the panels can be fabricated with ordinary construction tools. Corrugation of the panels matched that of the roofing and siding, thus making the use of sash or steel framing unnecessary. *From a release of Structoglas, Inc., Cleveland, Ohio.*

Helmet For Protection Against High-Voltage Arcing

Protection from dangers of high-voltage switch-throwing at a New England utility is provided by helmet which has green acetate window strip and neoprene-coated glass fiber reinforced bib and drape. (From a release of Reeves Brothers Inc., New York, New York.

NEW Solenoid Valve V-4019

for water and other light fluids

small in size, high in capacity

APPROXIMATE CAPACITY, GALLONS PER MINUTE, WATER SERVICE

Differential Pressure (psi)	1.25	3	5	10	30	40	50	100
½" Valve	5.6	8.7	11.3	15.6	27.3	31.6	35.2	50
¾" Valve	7.8	12.1	15.6	21.9	38.2	44.2	49	70

Pressure Ratings: Operating pressure—100 psi max.; 1¼ psi min. for full flow. Body rating: 150 psi, nominal body rating

Fluid Temperature Ratings: 125 F max. at 125 F ambient
175 F max. at 77 F ambient

Capacity Index (C_V): ½" size—5, ¾" size—7

Electrical Rating: 120, 208, 240 volt, 50 and 60 cycle ac

Use this pilot-operated, soft-seated solenoid valve for reliable on-off control of water or other light, non-viscous non-corrosive fluids. It's of floating-piston design for quiet operation. The power head can be rotated 360° for ease of wiring. Body material is brass. Can be used for normal and chilled water applications . . . operates from any standard SPST controller or on-off switch.

Get complete details from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

First in Control

"DISTRIBUTOR DAN, THE SKF BEARING MAN, FOUND THE REASON FOR THE HARD TURNING SHAFT"

"We couldn't find the reason for this condition," the foreman told the mechanic. "Distributor Dan found that the adapter was tightened excessively. He told us to loosen the locknut and sleeve assembly—retighten sufficiently to clamp the sleeve on the shaft but be sure the bearing turns freely. Now he's checking to be certain the bearing has proper clearance."

This is only one example of how *authorized* SKF distributors help solve their customers' bearing problems. Such services can be valuable to you—as vital as immediate delivery from the distributors' large, diversified stocks of SKF bearings.

So, why not find out all the services authorized SKF *distributors offer? Just ask the nearest one to call today.*

5926

Spherical, Cylindrical, Ball, and "Timken" *Tapered Roller Bearings*

EVERY TYPE—EVERY USE

SKF®

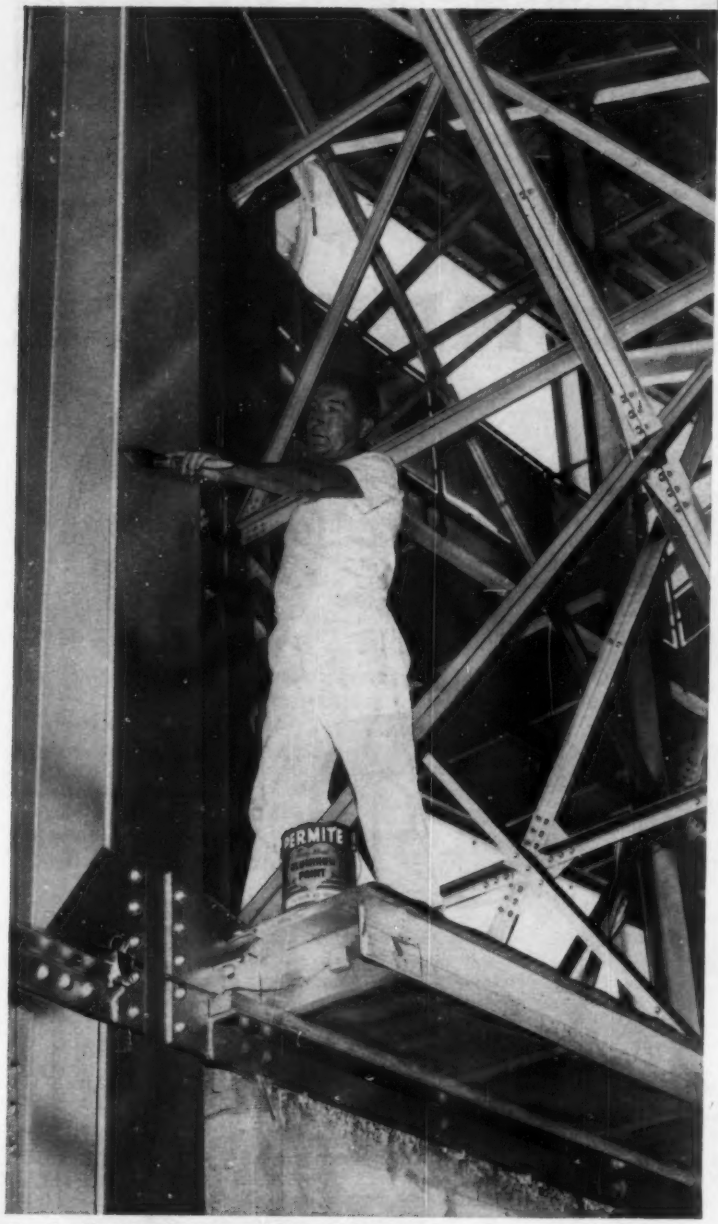
SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

*REG. U. S. PAT. OFF.

For more facts circle 534 on Reply Card

ORANGE BOWL SPECTACLE

everywhere you look BRIGHT, CLEAN PERMITE ALUMINUM PAINT



Permite Aluminum Paint, supplied by Stein Paint Co., Miami, protects all exposed metal in the Orange Bowl. Permite is made by Permiteco, Inc., Dayton 3, Ohio, and Modesto, California.

A matter of pride with the city of Miami is keeping its famous Orange Bowl in top trim. That's why the Property Maintenance Department recently ordered a fresh coat of Permite Aluminum Paint, made with ALCOA® Pigments. Everywhere—on railings, pillars, structural members—gleaming aluminum ensures weatherproof protection and uniform appearance for years.

There are other benefits. C. E. Taillon, painting superintendent, cites aluminum's economy and hiding power. One coat covers old surfaces completely—stains and old paint don't bleed through. A good aluminum paint like Permite forms a moistureproof seal that resists corrosion, keeps property from depreciating.

Insist on this same protection for your plant and equipment. Simply specify a quality aluminum paint made with ALCOA Pigments.

ALCOA does not make paint, but ALCOA Pigments are used in more aluminum paints than any other brand. Special formulas have been developed by paint manufacturers like Permiteco, Inc., to solve individual problems. Paints made to these formulas actually cost less, last longer, give utmost protection against heat, cold, sun, rain, smoke and fumes.

Write for our booklets, *Painting With Aluminum* and *Aluminum Roof Coatings Make Time Stand Still.* Use the coupon.

Look for this label . . . it's your guide to the best in aluminum value

PIGMENTED WITH ALCOA ALUMINUM

For exciting drama watch "Alcoa Presents" every Tuesday, ABC-TV, and the Emmy Award winning "Alcoa Theatre" alternate Mondays, NBC-TV

Aluminum Company of America
1740-M Alcoa Building, Pittsburgh 19, Pa.
Please send your free booklets:

☐ *Painting With Aluminum*
☐ *Aluminum Roof Coatings Make Time Stand Still*

Name_____
Company_____
Address_____
City_____ Zone____ State_____

For more facts circle 535 on Reply Card

When unit heaters are "over-the-hill,"

Been wondering when this relic would quit on us. Well—let's haul 'er down . . . maybe we can patch that leak.
W-h-e-w! Wore job! For a while there I thought we'd have to blast it loose.
No wonder it leaks . . . looks like something dredged up from Davy Jones' locker. This coil is really corroded.

1 When an old unit heater starts to leak, it's almost a sure sign useful life is over. Repairs are usually a waste . . . it's wiser to replace.

2 Major repairs are time consuming . . . and costly. What's more, once a leak appears, chances are additional leaks will soon crop up.

3 Unit heater failure is generally caused by corrosion. And it's *impossible* to inspect the extent of corrosion *within* heating coil tubes.

. . . it pays to REPLACE

HORIZONTAL — Can be direct-from-pipe suspended . . . without other supports. Vertical louvres may be added for complete directional control. Available in 24 sizes.

POWER-THROW® — For hard-to-heat locations. High-velocity discharge assures exceptionally long heat-throw . . . up to 140 feet. Ten sizes.

VERTICAL — Made in 28 sizes . . . choice of 4 air deflectors. Depending upon size selected, mounting height may vary from 10 to 60 feet.

PROPELLER-TYPE GAS-FIRED MODINES feature direct-fired contoured tubes, clog-proof burners, corrosion-resistant metals. Eight sizes . . . 25,000 to 310,000 Btu.

In Canada: Sarco Canada, Ltd., Toronto 8, Ontario

repairs are a waste of time and money . . .

4 Because no one can foretell where or when the next leak will occur, repairs only prolong the unit's life for an *unpredictable* length of time.

5 Unit heater failures often interrupt production. Well-planned replacement avoids this . . . units can be replaced in summer and early fall.

6 Replacement with new Modines ends danger of shutdowns, expense of frequent repairs. And you'll find new Modines heat better, use less fuel.

with new Modines

One little leak can mean the start of skyrocketing maintenance costs. In *time* alone, it costs from $25 to $300 to disconnect, take down and re-install an "old-age" unit heater . . . depending on size, type and mounting height. Add the actual repairs — and the final cost is prohibitive. In addition, a leak is a sign that the unit is weak in other places. New leaks will probably develop soon . . . and with increasing frequency.

A planned replacement program can avoid costly production delays. Service records show that most unit heater failures occur during coldest weather . . . interrupt production at critical times. With a well-planned replacement program, failures can be anticipated. Units can be replaced in fair-weather months without hampering production.

In some plants, units are *automatically scheduled for replacement* after they have been in service for a pre-determined number of years . . . usually after they have been depreciated on the company's books.

A Modine replacement program offers many cost advantages. In teaming with Modine to establish your own replacement program, you avoid production stoppages and frequent (often useless) repairs. Also, you get the many benefits of new Modine efficiency.

Modine motors are designed for lower power consumption. Sealed-in bearings eliminate need for periodic lubrication. Vertical fins discourage accumulation of dirt, lint and other materials. Other features include improved structural strength and durability, quieter operation, lighter weight. They add up to low-cost maintenance, better heating performance, greater fuel economy.

COMPLETE REPLACEMENT PROGRAM DATA! See your Modine distributor or use the coupon to get (1) full information on replacement program, (2) 22" x 24" wall chart containing unit heater maintenance tips and a valuable performance check list, (3) Modine's "Repair or Replace?" bulletin, (4) Gas Unit Heater Installation Guide.

IMMEDIATE DELIVERY FROM LOCAL STOCK! Modine wholesalers are located in all principal cities. Call the Modine representative nearest you . . . he's listed in the yellow pages.

Modine®
MANUFACTURING COMPANY

MODINE MANUFACTURING COMPANY
1563 DeKoven Ave., Racine, Wisconsin

Send full data on replacement program ☐; wall chart and "Repair or Replace?" bulletin ☐; Gas Unit Heater Installation Guide ☐.

NAME .....

FIRM .....

ADDRESS .....

SU-1399

For more facts circle 536 on Reply Card

OPERATION AND PRODUCTION —pointers for the industrial plant engineer

Edited by Vern Kempf

Man-Made Fibers Stop Lint

LINT, a major problem in industries producing delicate mechanical and electrical components, has been found to be virtually eliminated from manufacturing areas where workers wear uniforms woven of continuous filament yarns of 100 per cent Dacron polyester fiber.

A pioneer in using the new uniforms is Sylvania Electric Products, Inc., producers of electron tubes. Used in radio, television, data processing equipment, airplanes, guided missiles and warning systems, it is imperative that the tubes be assembled in a lint-free manufacturing area.

Although the Sylvania plant at Altoona, Pa., is completely air conditioned, it was found that the lint count in the production area could be even further reduced by clothing the women assembly line workers in lint-free uniforms.

To qualify for use in this plant, the uniform fabric must pass a minute examination under a 10-power magnifier and show up as a completely smooth, lint-free weave. The Du Pont Company, manufacturer of the continuous filament polyester fiber that goes into the new uniforms, is greatly interested in these applications. The company's Textile Fibers Department has set up a consulting service on industrial uniforms to aid firms interested in lint problems.

Probe Measures Wall Thickness

CHECKING core shift in this complex magnesium casting is readily accomplished with an ultrasonic resonance gage at the Farmingdale, L. I., plant of the Republic Aviation Corporation. To prevent any possibility of developing excessive or unequal stresses on aircraft, allowable core shift tolerance is only plus or minus 0.030 in.

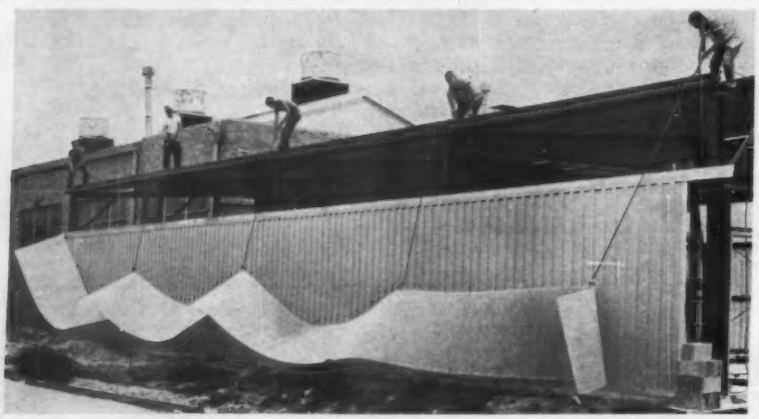
Made by Branson Instruments, Inc., the resonance gage requires access to only one surface so that all vital dimensions are easily checked. One technician can finish the job in one hour with higher accuracy than previously obtained with calipers.

Thickness readings are instantaneous and accurate to within 0.1 to 1 per cent, depending upon the material being tested. The gage is simple to use as the operator merely slides a probe across the outer surface of the material and reads varying wall thickness from a direct reading scale.

Operator slides probe along surface of material and reads thickness of wall sections from scale on ultrasonic gage.

Ultrasonic resonance gaging is based on the fact that the natural frequency of a metal or plastic varies inversely with its thickness. Continuously varying high-frequency vibrations in the range of 0.7 to 25 megacycles are transmitted into the material under test through the transducer. Reflected waves are amplified by the instrument and resonant frequencies or harmonics show up as vertical traces on a cathode-ray screen. A suitably calibrated scale, placed in front of the screen, permits thickness to be read directly.

Plastic Sidewall Glazing in Long Rolls Saves Labor



Plastic sidewall glazing in roll form saved considerable labor on the new building of Warner Machine Products, Inc., Muncie, Indiana. Available in lengths up to 150 ft and widths up to 51 in., corrugated Corostron rolls were put in place in a few hours time. A product of Fiber Glass Plastics, Inc., Miami, Fla., material is a new acrylic polyester resin product of Rohm & Haas Company.

Stops Air Condensate Problems

AN ALABAMA stamping plant experienced frequent equipment shutdowns due to water forming in air lines. This was particularly troublesome following week-end shutdowns when outside air temperatures were low. Although the air system was equipped with an aftercooler as well as a purifier, water vapor condensed in the lines beyond the aftercooler due to the low surrounding temperatures.

To remove this moisture, low cost Anderson purifiers and drainers were installed immediately ahead

New RIDGID® No. 141
Geared Threader for 2½", 3", 3½", 4" Pipe and Conduit

One Set of Dies!

JAM-PROOF!

New Cam-Action Workholder!

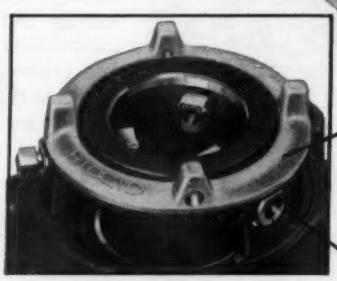
No. 141

Save Time . . . Cut Costs on all large threading jobs

1. Only 1 Set of High Speed Dies threads 2½", 3", 3½" and 4" pipe and conduit. No extra die sets to change or lose! Die size change plate sets quickly and locks at desired size. Easy adjustment for tapered, straight, over or under size threads.

2. Jam-Proof for safe power or hand threading. Drive pinion kicks out automatically. Die head **Can't Jam** causing costly repairs and delay.

3. New Fast-Action, Cam-Type Workholder sets to size by quick turn of collar. Set screw holds work centered for perfect threads every time.



Pat. Appl'd. For.

No. 161

For 4", 4½", 5" and 6" Pipe and Conduit, Buy the New RIDGID No. 161 Geared Threader!

- Only 1 Set of High Speed Dies
- Jam-Proof
- New Fast-Action, Cam-Type Workholder

See and buy these work-saving RIDGID Threaders at your Supply House!

RIDGID

The Ridge Tool Company, Elyria, Ohio, U.S.A.

For more facts circle 537 on Reply Card

IT'S GOOD PIPING

OPERATION — PRODUCTION

(O and P begins on page 54)

of the air powered stamping presses and other air controlled equipment. After 15 months of service, the stamping company reports no shutdowns or downtime due to moisture fouling the equipment.

Engineers of the V. D. Anderson Company, Cleveland, Ohio, who solved this problem, point out that although intercoolers and aftercoolers as well as purifiers are used in an air system, it is always advisable to install small air line purifiers at the point of usage to remove condensate which condenses out of the air after leaving the aftercooler. Such installations are inexpensive and soon pay their way.

Door Heaters Stop Cold Air

INSTALLATION of high-velocity door heaters at the American Furniture Company, Martinsville, Va., has solved a familiar industrial problem; the influx of chilled air through open shipping doors. Two of the company's plants face each other across a street and heavy traffic between them means that the shipping room doors in each plant must be opened frequently even in cold weather.

Heater, mounted above door, tempers cold air to make work area comfortable.

The resulting cold air flow increased heating costs, threatened exposed raw materials and adversely affected the efficiency of employees working near the doors. The problem was aggravated by dust collection system exhaust which creates a negative pressure inside each building. This slight vacuum adds to the velocity and volume of air admitted when the doors are open.

After a study of several possible solutions, American Furniture installed high-velocity door heaters made by L. J. Wing Mfg. Co. A heater was installed above and just in front of each door with its discharge eight and one half feet above the floor. The heaters are operated continuously and the resulting curtain of warm air tempers the incoming air to keep working areas near the door at comfortable temperatures.

Simple Drill Press Makes Precision Reamer

USING a simple Delta drill press plus a precision workholding fixture instead of a horizontal boring machine, Lionel Corporation, Irvington, N. J., can now ream holes in fishing reel frames in one quarter of the time previously required. A

(Continued on page 58)

Adhesive Bonding Simplifies Assembly of Gear on Rotor Shaft

YIELDING shear strengths in excess of 4500 psi, adhesive bonding is being used by the Haydon Division, General Time Corporation, Torrington, Conn., in the assembly of small pinion gears to rotor shafts. These gear assemblies are used in timing motors which require small gear trains of very high accuracy.

Previously-used joining methods, in many instances, distorted the gear configuration or altered metal hardness due to the high temperatures involved in the brazing operation.

In the bonding operation, the rotor shaft is dipped into the adhesive, furnished by Minnesota Mining and Mfg. Co., through a control hole in a special applicator. The pinion gear is then pressed in place on the adhesive coated rotor shaft by means of a foot press. The assemblies are cured for one hour in an oven at 350 F.

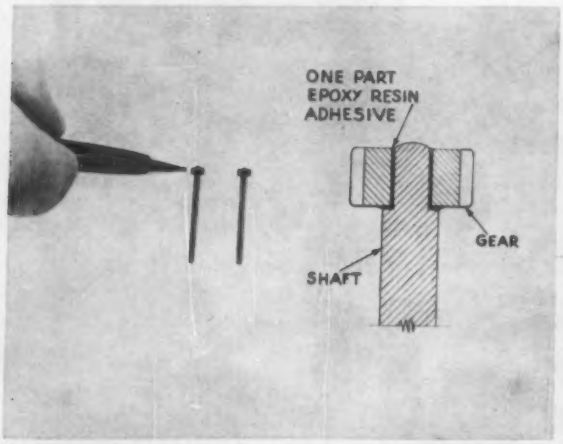


Fig. 1. Adhesive bond holds gear tightly to the rotor shaft.

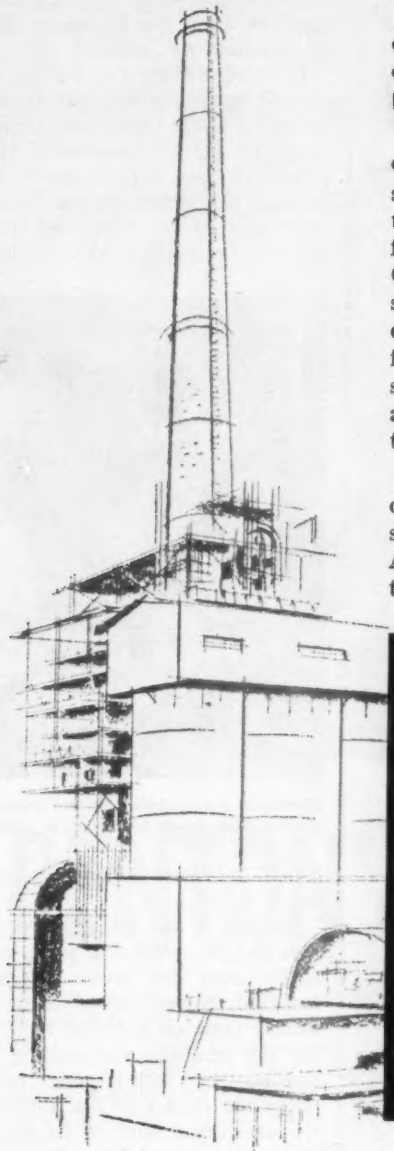
Fig. 2. Special applicator insures proper adhesive coating.

ONE OF THE GARLOCK **2,000**

IT'S GOOD PIPING PRACTICE TO USE

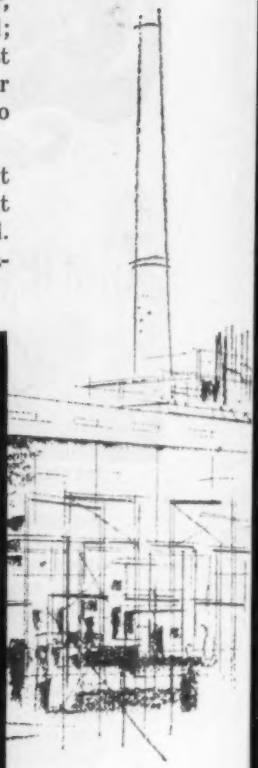
Garlock Rubber Expansion Joints

• Prevent Stresses • Eliminate Vibration, Noise • Compensate for Misalignment • Reduce Flange Breakage



• Garlock All-Rubber Expansion Joints react to the slightest pressure . . . provide complete piping protection at all times. Moreover, they are internally reinforced with steel rings to assure greater strength. Garlock spool type rubber expansion joints are made in sizes ¾" to 84" inside diameter; in round, rectangular, offset, multiple arch, concentric and eccentric tapered; for use against water, oil, mild acids, gases, and exhaust steam. "U" type expansion joints are available for applications ranging from lightweight equipment to turbines.

Rubber Expansion Joints are another important part of "the Garlock 2,000" . . . two thousand different styles of packings, gaskets, and seals for every need. Ask your Garlock representative for his recommendations, or write for Catalog AD-137.



THE GARLOCK PACKING COMPANY, Palmyra, N.Y.

For Prompt Service, contact one of our 26 sales offices and warehouses throughout the U. S. and Canada.

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Molded and Extruded Rubber, Plastic Products

Canadian Division: The Garlock Packing Co. of Canada Ltd., Plastics Division: United States Gasket Company

For more facts circle 538 on Reply Card

Marley Double-Flow Aquatower® *Cools a Cupola*

This Double-Flow Aquatower is part of an important forward step in foundry production. It saves a machine tool manufacturer the appreciable expense of constantly replacing cupola lining, since the water-cooled unit it serves is unlined. Your plant probably doesn't melt iron, but it does have one or more "hot spots" that can be converted to a trouble-free "profit spot" by efficient cooling with a Marley Double-Flow Aquatower.

"Hot spots" that alert plant engineers are eliminating include: plastics molding presses . . . candy slabs . . . furnace doors . . . air compressors . . . can coolers . . . welding equipment . . . refrigeration and air conditioning . . . and these are only a few of the many services in which Marley controlled-temperature cooling is paying off in big figures.

In every instance they produce a double-dividend of increased plant efficiency and reduced operating cost, for Double-Flow Aquatowers save more than 95% of cooling water used in a once-through system, an economy that soon amortizes original investment. They are famous for simple operation and conservative maintenance requirements.

Whatever type "hot spots" exist in your plant, present your problem to the Marley engineer in your area (in 60 major cities). He will analyze your situation and select the Marley tower that pin-points your specific need. We will be glad to put you in touch with him; just write to

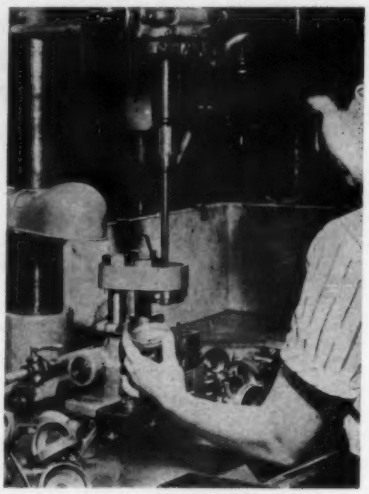
MARLEY **THE MARLEY COMPANY**
KANSAS CITY, MISSOURI
For more facts circle 539 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

semi-skilled operator now reams 350 pieces per hour compared to 87 per hour produced by a skilled operator when the horizontal boring machine was used.

Cost of tooling for boring increased quantities of reel frames and for a similar operation on reel spools caused the company to take a second look for a more economical production method. Tolerances on both the frame and spool are plus or minus 0.0002 in. with a total indicator concentricity reading of 0.005 in.



Precision workholding fixture converts simple drill press to accurate reamer.

At first it did not seem reasonable that the $400 drill press, ordinarily used for wider tolerance freehand drilling, could do a job usually done on a $5000 tool. Using the precision workholding fixture equipped with a guide bushing above the work part and shimming the drill press head on its column to insure near perfect perpendicularity, Lionel obtained the same accuracy as with the more expensive machine.

Sturdy Pipe Hanger At Low Cost

HERE IS AN inexpensive pipe hanger that can be assembled from materials readily available in the average shop. Details may be

Highly corrosive elements in processing system at Chemical Contour plant in Gardena, California, cannot harm this all-Penton ball valve (inset). A complete line of Penton valves is available from Chemtrol, Lynwood, California.

PENTON* handles jobs no metal can touch

Another example of the type of anticorrosion job that Penton does best is in the new process of chemical milling. In the heart of this processing system there's a Penton valve that has now been in operation for more than 10 months with no sign of failure. Installed in the drain line of a chemical milling tank, this Chemtrol ball valve is continually exposed to a 160°F. solution of concentrated nitric and hydrochloric acids with dissolved chloride salts and oxides. This bath is formulated specifically to eat away stainless steel, and the corrosive effect of these hot acids is apparent in the metal fittings surrounding the valve. But they haven't affected this all-Penton Chemtrol valve. It still looks and works like new—inside and out.

Penton outperforms other plastics, and even expensive metals, in many corrosive exposures involving high-working pressures and elevated temperatures. Now not only valves, but many other components for chemical processing systems are readily available. Pump parts, pipe, tubing, pipe fittings, and meter parts made with Penton permit the design of a complete Penton package for economical and efficient processing.

Why not look to Penton for the solution to your corrosion problems. For additional information, call or write:

Penton is the Hercules registered trademark for chlorinated polyether.

Cellulose Products Department

HERCULES POWDER COMPANY

INCORPORATED

900 Market Street, Wilmington, Delaware

CP59-17

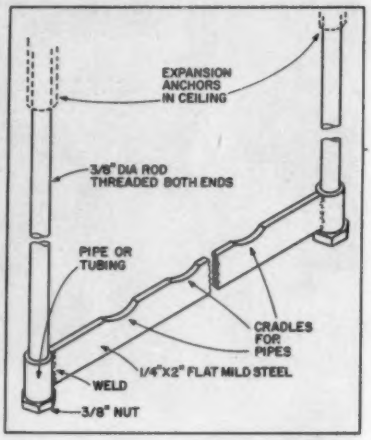
For more facts circle 540 on Reply Card

CHAMPION
of the four major brands of lamps
CHAMPION
stands out for
VALUE
Light/per/dollar . . . the measure of value in lamps . . . delivered in full measure by Champion lamps . . . sound reason for choosing Champion's as your company's best buy.
CHAMPION Lamps
Incandescent
Fluorescent
Your best buy in lamps
CHAMPION LAMP WORKS, Lynn, Massachusetts
For more facts circle 541 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

varied, of course, to suit a given installation. Basically the hanger consists of two ⅜-in.-diameter rods, threaded on each end, suspended from expansion anchors placed in the concrete ceiling. Flat stock is used for the cross piece and short sections of pipe or tubing are welded to the ends to take the ceiling rods. The cross piece is supported by nuts on the lower ends of the supporting rods. Cradles for the pipes



Sturdy low cost pipe hanger is assembled from readily available materials.

are made by a cutting torch or by hot or cold forming.

To carry four medium size pipes, the flat stock could be ¼ in. by 2 in. mild steel. Jigs can be used to produce the hangers in quantity.

Spraying Adhesive Saves Time

SPRAY EQUIPMENT is being used at Clutch Exchange, Inc., Denver, Colorado, to apply adhesive to industrial brake linings for subsequent bonding to brake bands. Before this method was put into use the adhesive was brushed on.

Sprayed adhesive coatings are smoother, more uniform, and claimed to be at least four times faster than previous methods. In addition, material savings are estimated to be around 50 per cent.

The system consists of a Binks spray gun, a five gallon pressure tank and the necessary valves and hoses. Air pressure is held low, 35

to 40 psi, and fluid pressure is around 15 psi to minimize overspray. This low pressure allows spraying without a spray booth.

Before the linings are bonded to

Sprayed coatings are smoother and reduce material by about 50 per cent.

the brake bands, the bands are shot-blasted, then coated with a phenolic resin to cut down corrosion. After the linings are sprayed with adhesive they are allowed to stand for 24 hours, then clamped to the brake bands.

Assembled bands are then baked in an oven for approximately 30 minutes. Oven temperature is set to give a bond line temperature of around 400 F. Bond line temperature is the temperature between the band and the lining, not necessarily the oven ambient temperature.

Heat Part of Open Plant?

DO YOU HAVE a building where people work in only a small portion of the total area? If you do, you will be interested in the infrared heating system used at Junkin Safety Appliance Company, Louisville, Kentucky.

Half of the building is heated with gas-fired infrared heat generators, leaving most of the storage area unheated. Because these units provide direct heat, Junkin maintains comfortable working conditions even with constant air movement between heated and unheated areas.

Seven units, made by Perfection Industries, are suspended in one line along one side of the 50 ft by

Here's why any powder-actuated tool works better with Remington Loads and Studs

Exclusive "Kleanbore" Priming

22 caliber Power Load (twice actual size)

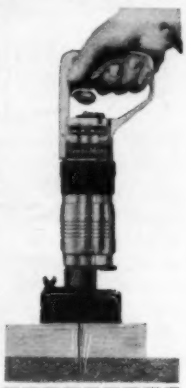
Scientifically graded Remington Power Loads offer precise, uniform charges . . . have strong, non-rusting brass cases. Exclusive "Kleanbore" priming mixture protects bore of tool because it does not cause rust or corrosion. No need to clean barrel after every job! These quality Power Loads are subjected to multiple inspection during manufacture, are backed by Remington—a name well known to American sportsmen. No matter what powder-actuated tool you use, it will work *better* with Remington Power Loads!

Green "Power-Guide"

¼" S-25 Stud (twice actual size)

Uniform performance and penetration are assured with precision-made ¼" and ⅜" diameter Remington Studs. These high-strength studs are made with special molybdenum steel. Specify Remington Studs with exclusive green "Power-Guide" heads . . . for uniform performance and straight-driving penetration. Over 60 "job-rated" Studs to choose from—your assurance of a Remington "Power-Guide" Stud to fit every fastening application.

Remington know-how insures the quality of its Studs and Power Loads. No other company can offer the background of experience gained through the manufacture of billions of these units. When you order studs and loads, you'll get better performance if you specify Remington—maker of the most versatile fastening tool ever designed (right). We'll gladly send valuable free booklets about Remington Power Loads, Studs and fastening tools. Mail the coupon today!



Remington Model 455A Stud Driver

Remington

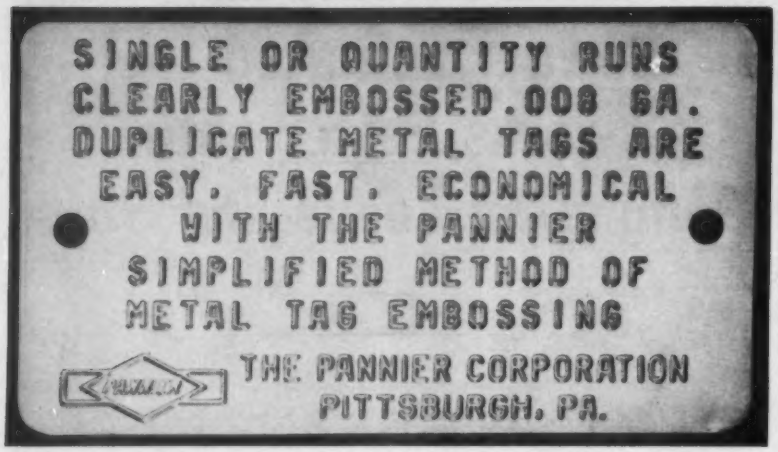
DU PONT

Remington Arms Company, Inc., Bridgeport 2, Conn.
IN CANADA: Remington Arms of Canada Limited, 36 Queen Elizabeth Blvd., Toronto 18, Ont.

Remington Arms Company, Inc., Bridgeport 2, Conn. H-12
Please send—without obligation—catalogs on Remington Contractor & Industrial Tools checked:
☐Stud Drivers ☐Air Tools ☐Chain Saws
☐Concrete Vibrators ☐Flexible Shaft Machines
Name_____ Position_____
Company_____
Address_____
City_____ Zone___ State_____

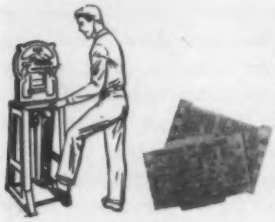
For more facts circle 542 on Reply Card

CUT YOUR METAL TAG COSTS...



. . . Get clearer, sharper impressions, with PANNIER EMBOSSING MACHINES

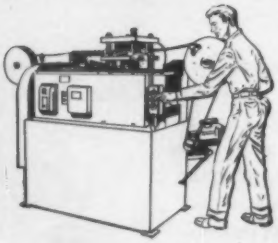
Whether you use embossed metal tags in large, production quantities — or just a few, occasional tags — Pannier simplified embossing equipment is engineered to provide your metal tags at the lowest possible cost, greatest safety and easiest readability. Inexperienced help can operate any of the machines, large or small.



One to four tags at a time (model 344)

Model 344 Pannier Embossing Machine has two uses. It can emboss up to 4 duplicate tags, like that pictured above, in sizes up to 3" x 5½" or longer, at one operation (one letter at a time).

This same machine provides the low cost, matched male and female embossing matrices (shown at left) for use with Model 207. Paired, these two machines provide complete equipment for volume tag production.



Volume Tag Production (No. 207)

The Pannier Master Marker Embossing Machine, Model No. 207-H-6 automatically produces up to 60 duplicate tags per minute, employing coils of Pannier Safety Tag stock. These tags, in strip form, are nicked and notched for easy detachment from the coiled strip. Embossing impression is made by inexpensive male and female metal matrices—that cost only a fraction of type-and-matrix methods. The machine operates by start-stop pushbutton control. Fingers never approach the embossing area.

For single, occasional tags

Pannier engineering provides a wide range of Master Marker Embossing Machines to suit any quantity requirement. This small hand-held Embosser makes individual tags on half-inch strip metals or vinyl plastic.

Pannier Embossed Tags

You can order all your tag requirements from Pannier. They're embossed for you on these same machines. Tags are low cost and delivery service is fast. They can be made to your specifications, or write for standards and price list.

Write for literature or Pannier engineering service, specifying style and quantity of tags you require.

MARKING DEVICES
THE PANNIER CORPORATION
510 PANNIER BUILDING PITTSBURGH 12, PA.
Offices: Los Angeles • Cleveland • Chicago • Philadelphia • Birmingham

PANNIER MASTER MARKERS FOR QUALITY

For more facts circle 543 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

100 ft building and radiate over an area 25 ft by 85 ft. Rated at 168,000 Btuh, the units maintain a 70 F temperature inside the building until outside air temperature goes a few degrees below freezing.

In colder weather, the heat generators burn continuously and inside temperature may drop to 50 F or lower. With infrared sources, however, air temperature is not a measure of worker comfort. Employees work directly under the radiating surfaces of the units and 60 per cent of the heat energy is in the form of absorbable direct heat. The floor, tools and materials remain warm to the touch.

Propane gas was used originally because line gas was not available until recently. Supplied from a tank outside the building, the cost of operating the units on propane gas was 35 cents per hour or $2.80 for an eight hour day. Fuel cost, using the recently installed line gas, is $1.51 per eight hour day.

Heaters are controlled by a thermostat located four feet above the floor and operating on a 110 volt line. When the temperature falls below the thermostat setting, a solenoid valve on each heater opens and a pilot light ignites the gas. A thermocouple, heated by the pilot flame, generates a current to a secondary switch controlling the solenoid valve. Should the pilot flame fail, valve shuts off gas supply.

Infrared units confine heat to working area in plant with large storage space.

FRANK ADAM MIDGET POWERPLUGIN BUSDUCT

Hangers—One for each 5 ft. of busduct. For ceiling or side wall installations.

Plugin Device—Two spring prongs attached to device, catch and lock on the inside of duct to form a rigid support. Also act as ground connection to duct.

Plugin Outlets on 12" Centers—Provide electric power where it's needed, when it's needed. 100 amps., 250 volts or less.

A perfect example of how Frank Adam Midget Powerplugin Busduct keeps pace with the future!

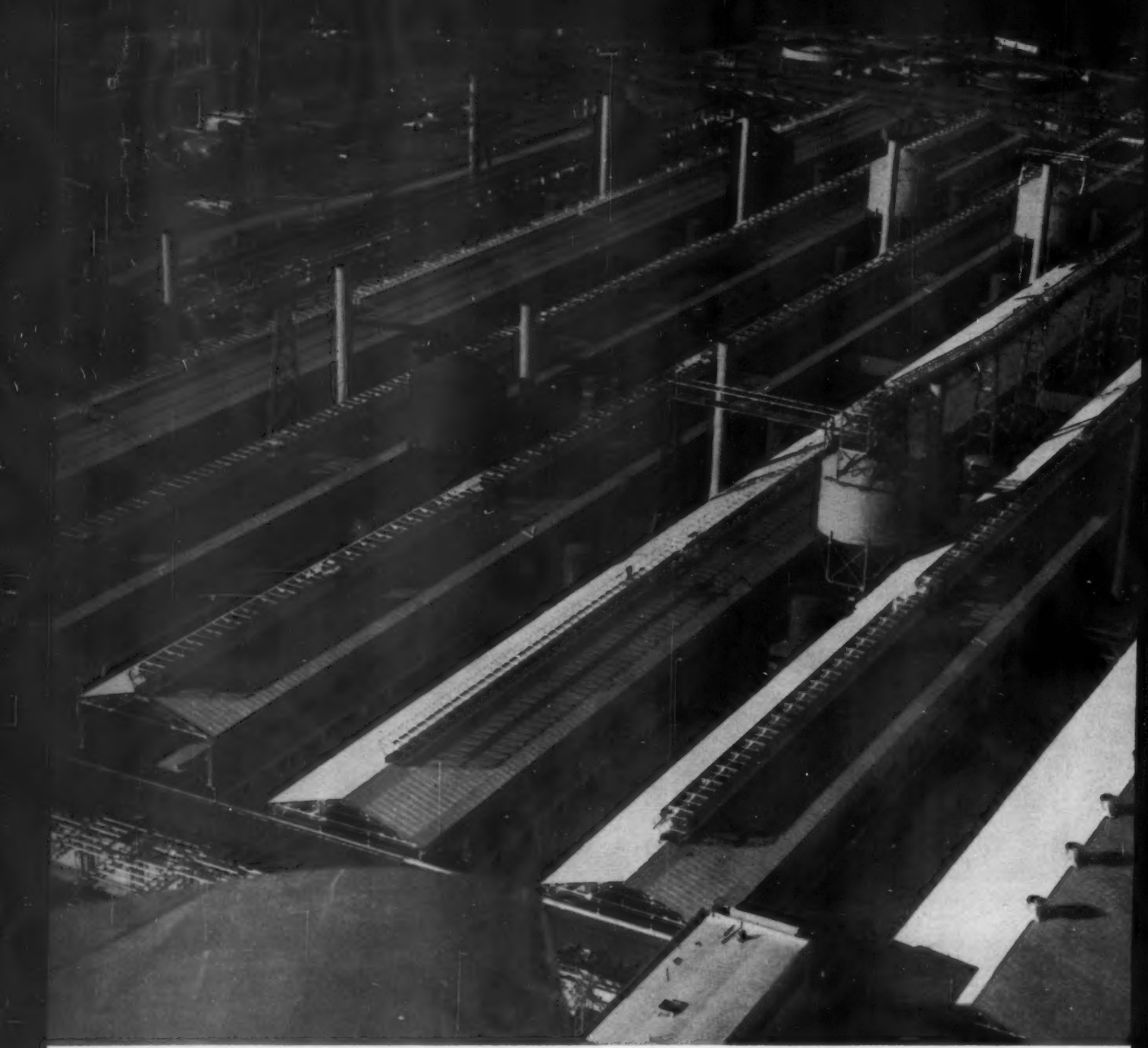
Present classroom equipment can be moved and plugged-in almost as easily as an electrical appliance . . . the busduct quickly relocated if necessary. If additional busduct is needed for future expansion, it can simply be added to the old! Cuts costly rewiring—keeps electrical downtime to a minimum.

For an economical and versatile electrical power supply that will stay modern for years to come, specify and insist on quality built Frank Adam Midget Powerplugin Busduct.

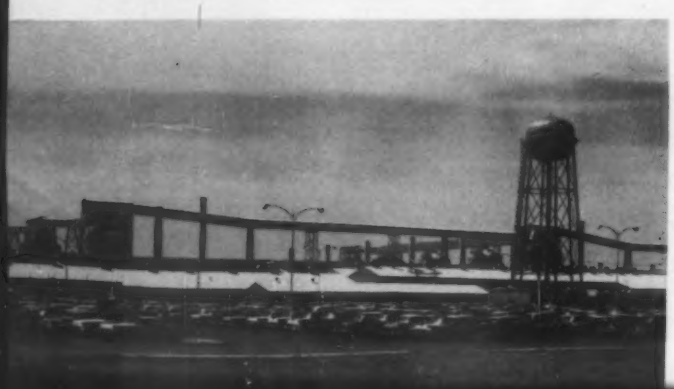
FRANK ADAM ELECTRIC COMPANY
P. O. BOX 357, MAIN P. O. · ST. LOUIS 66, MO.

busduct · panelboards · switchboards · service equipment · safety switches · load centers · Quikheater

For more facts circle 544 on Reply Card



USS American Bridge fabricates and erects 30,000 tons



This is Reynolds Metals Company's new aluminum reduction plant at Massena, New York. American Bridge Division of United States Steel fabricated all of the steelwork and erected all buildings, tanks, conveyers and stacks.

It was a big job . . . completed on schedule.

Have any industrial construction coming up? Contact the nearest American Bridge office in any of the cities listed on the following page.

USS is a registered trademark

# of steelwork for giant new industrial plant

Here are dimensions of some of the major installations:

. . . 111′ x 934′ metal service building, with 20′6″ x 400′ lean-to.
. . . Six pot room buildings, each 63′ x 1,315′, one story, with crane runway.
. . . 90′ x 505′ machine shop.
. . . Detanking building, 41′ x 80′, 55′ high.
. . . Four storage tanks, 16′ dia. x 48′ high.
. . . Two storage tanks, 46′ dia. x 48′ high.
. . . Eight storage tanks, 50′ dia. x 33′3″ high on 45′ towers.
. . . Fourteen fume stacks 8′6″ dia. x 110′ high with conical base.

USS American Bridge Division of United States Steel

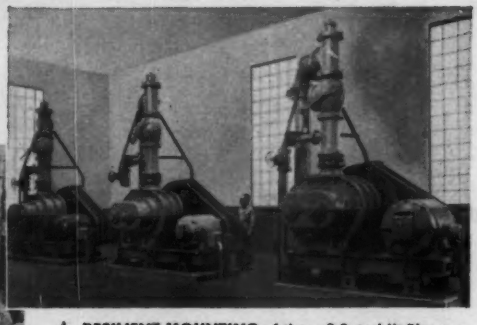
General Offices: 525 William Penn Place, Pittsburgh, Pa.
Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago Cincinnati • Cleveland • Dallas • Denver • Detroit • Elmira • Gary • Harrisburg, Pa. Houston • Los Angeles • Memphis • Minneapolis • New York • Orange, Texas Philadelphia • Pittsburgh • Portland, Ore. • Roanoke • St. Louis • San Francisco • Trenton
United States Steel Export Company, New York

For more facts circle 545 on Reply Card

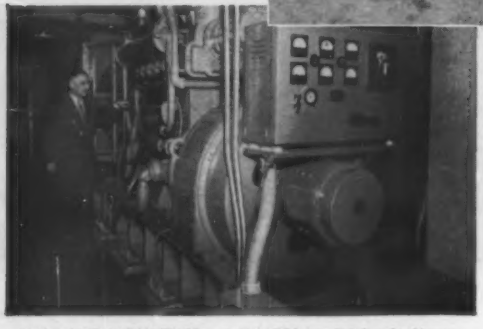
RESILIENT MOUNTING

CUTS FOUNDATION COSTS IN HEAVY MACHINERY INSTALLATIONS

RESILIENT MOUNTING of this 400-ton capacity Clearing press at the RCA-Whirlpool-Seeger Plant in St. Paul, Minn., directly on Korfund Vibro-Isolators effected dramatic savings in eliminating special foundations and reinforcement. Isolators protect the structure, nearby equipment, personnel, and the press itself from shock and vibration. View at right shows mounts being installed below floor level. →



RESILIENT MOUNTING of these 3 Sutorbilt Blowers at the City of San Jose, California, Sewage Treatment Plant on Korfund Vibro-Isolators cut foundation costs and provided trouble-free, *complaint-free* operation, even though the plant is located in a residential area.



RESILIENT MOUNTING of this 300-hp Fairbanks-Morse Diesel-Electric Generator at General Telephone Co. of Los Angeles on Korfund LK/E Vibro-Isolators completely eliminated the need for a foundation, yet protects delicate switching and electronic apparatus from malfunction and damage due to vibration.

RESILIENT MOUNTING, soft, but elastic, is safe and practical. Korfund steel spring mounts prevent transmission of vibratory forces and change harmful sudden shock loads to harmless gradually applied forces. Foundation costs are cut! It is no longer necessary to add the usual 100%, or higher, safety factor for dynamic forces—required with rigid mounting methods—when figuring structural and soil loads, if Korfund resilient mountings are used. Korfund Vibro-Isolators absorb these dynamic forces and protect the structure and the machine itself from damage due to vibration and shock.

Next time you run into a problem of this kind, it will pay you to get in touch with Korfund first. Many case histories with complete specifications are available. Chances are, Korfund engineers have solved a problem just like yours in the past. Meanwhile, write today for your copy of Bulletin 61 which gives full details.

Vibration & Shock isolators for industry, aircraft, missiles, shipping
Flexible metal & rubber connectors
Acoustical products
Vibration instruments
Research & development

KORFUND

THE KORFUND COMPANY, INC.

48-35R THIRTY-SECOND PLACE, LONG ISLAND CITY 1, N. Y.

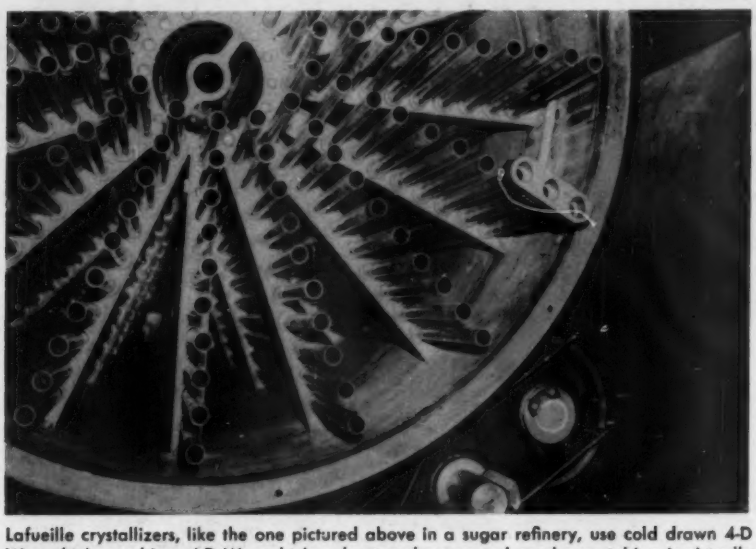
VIBRATION • SHOCK • NOISE / CONTROL & MEASUREMENT SPECIALISTS FOR MORE THAN HALF A CENTURY

For more facts circle 546 on Reply Card

For more facts circle 547 on Reply Card →

BYERS GUIDE

Maintenance and Operating Tips from A. M. Byers Company



Lafueille crystallizers, like the one pictured above in a sugar refinery, use cold drawn 4-D Wrought Iron tubing. 4-D Wrought Iron heat exchanger and condenser tubing is virtually unaffected by refrigerating gases such as ammonia, carbon dioxide and Freon. Highly resistant to both corrosion and abrasion, 4-D lasts longer than many higher priced ferrous and non-ferrous metals in salt water, heat transfer brines, and industrial cooling waters.

Industrial Plants Report a Tubing Material More Durable Than Expensive Alloys

Industrial maintenance records indicate cold drawn Wrought Iron tubing displays more durability than expensive alloys and non-ferrous materials. Invariably, 4-D gives longer tubing service life than carbon steel.

Here are two reports on typical industrial applications:

- A double-tube ammonia condenser in an ice plant had steel tubes. The cooling water used in this condenser contains 76 ppm of sodium chloride. The steel tubes failed after 2 years and were replaced by Wrought Iron tubes which are still in excellent condition after 18 years.
- Vaporizers for butane and propane gas production handle petroleum under pressure at ambient temperatures (10°F. min.). Petroleum is vaporized by passing steam at 10 psi and 265°F. through tubes inserted in the jacket. The unit operates continuously. In this application mild steel tubes were destroyed in 3 to 6 months and stainless steel tubes in 6 to 9 months. Wrought Iron tubes are serviceable for at least *two* years.

We have a technical report which covers briefly, but informatively, 15 similar heat transfer equipment installations. Actual names and places of the installations appear in this report. Comparative cost-per-foot-per-year figures have been calculated for Wrought Iron and steel. A copy of this convincing study will be sent to you upon request.

Stack Service Life: Ripe Old Age or Early Demise?

The material you select for stack applications can make the difference of a lifetime. 4-D Wrought Iron resists acidic flue gas corrosion much more successfully than ordinary steel. Moreover, the protection of a 4-D Wrought Iron stack costs much less than a masonry stack.

4-D Wrought Iron in stack service gives no evidence of the rapid deterioration so characteristic of conventional materials. Although costing somewhat more than steel, 4-D often lasts more than twice as long. This saves the cost of at least one re-fabrication and re-installation, as well as accompanying interruptions and downtime. When building new stacks or replacing old ones, consider the long service life of 4-D Wrought Iron.

4-D Wrought Iron plate lengthens stack life, reduces maintenance costs at new Owens-Illinois Glass Company plant in Atlanta, Ga.

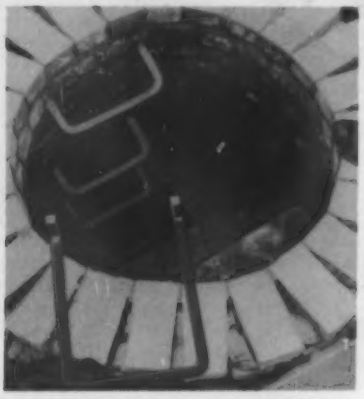
In Sulfuric Acid PVC Bests Stainless at 1/5 the Cost

Stainless steel pipe often fails where Byers Polyvinyl Chloride Pipe doesn't. Take sulfuric acid applications. Here, Byers PVC Pipe not only out-performs stainless in terms of corrosion-resistance, but costs less on an installed cost basis: only one-fifth the cost of stainless.

In a wide range of other corrosive applications where metal pipe is either unsatisfactory or quite costly, Byers PVC provides constant, uninterrupted service. In acid fume vent piping, acid reactor blowoff lines, drain and sewer lines, and process lines handling acids, alkalies, oxidizing agents, alcohols, brines, plating solutions, slurries and the like. Where product purity is important, Byers PVC Pipe is especially suitable. It won't contaminate. We have a raft of performance data on our PVC. Write us about your specific application or problem.

BYERS GUIDE

Maintenance and Operating Tips from A. M. Byers Company



Wrought Iron rungs are shown here set in masonry in the 85-foot Main Avenue water tunnel shaft in Cleveland, after serving 55 years. Because of uneven spacing, the old rungs were burnt off and replaced with new ones of 4-D Wrought Iron.

How Safe Are Your Manhole Ladder Steps?

To provide workmen with safe, secure footing on manhole ladders, it is imperative that the steps be corrosion-resistant. Damp, humid atmospheres found in tunnels are death to ladder steps made of ordinary metals. Ordinary metals don't stand the test of time and wear as well—or as economically—as 4-D Wrought Iron. 4-D is durable. Safe. Practical. Needs no protective coatings. A firmly anchored protective scale, developed by the material itself, acts as a shield against further corrosive attack. No other metal has this unique capability.

Many plants have developed a standard design for 4-D Wrought Iron ladder steps and stock them in quantities at the warehouse. Play it safe. Use 4-D Wrought Iron for fabricating your new ladder steps—or for replacing old ones.

U. L. Approval for 4-D Wrought Iron Conduit

Certification of 4-D Wrought Iron electrical conduit by Underwriters' Laboratories, Inc. offers plant people another new weapon for battling corrosion. The labeled conduit is especially suitable for highly corrosive plant applications where attack by aggressive elements causes excessive maintenance or replacement of ordinary conduit materials.

Wrought Iron has been used for over 50 years in corrosive electrical conduit installations not requiring U. L. certification. Now, with the U. L. label, 4-D Wrought Iron can be used for any conduit application. There's no internal flaking or clogging with this conduit. Its resistance to vibration and fatigue stress is excellent. Fabrication is a cinch. And it's sherardized and coated with MVC-1 vinyl. This guarantees easy fishing.

Through an agreement between A. M. Byers Company and National Electric Products Company, U. L.-labeled 4-D Wrought Iron conduit is marketed through National's 11 warehouses, 29 district offices and authorized distributors throughout the United States.

A Welding Tip Or Two

Each of 4-D Wrought Iron's two components—high purity iron base metal and glasslike iron silicate—has its own fusion temperature. The siliceous material melts first (2100°-2200°F.), several hundred degrees before the iron (2730° F.). But don't confuse the fluxing of the iron silicate with melting of the actual base metal. Just continue heating until the iron fuses. 4-D's self-fluxing action contributes to sound, durable welds.

WHAT IS "4-D"?

Wrought Iron is a two-component metal—high purity iron impregnated with non-rusting iron silicate fibers. *New 4-D* Wrought Iron was achieved by substantially increasing the deoxidation of the base metal, slightly increasing the phosphorous content, and using a more siliceous iron silicate. Result is increased corrosion resistance, improved mechanical and physical properties.

Literature Available

Literature described below is available on request. For information on specific applications, write Byers Engineering Service Department.

New four-color booklet, **4-D Wrought Iron: A New Dimension in Corrosion Control,** discusses in detail Byers' latest product development. Includes a test section which is graphically illustrated and shows comparative corrosion resistance of 4-D Wrought Iron, standard wrought iron and other ferrous metals.

New ten-page bulletin, **Cold Drawn Wrought Iron Heat Exchanger and Condenser Tubes,** cites actual installations in which the use of 4-D Wrought Iron and other metal tubing in the same equipment permits service life comparisons. Lists cost-per-foot-per-year for each material and the corrosive conditions present.

In the most technically complete PVC catalog yet prepared, we discuss our latest piping material—rigid unplasticized polyvinyl chloride pipe—its characteristics, applications, properties and installation practices. The **Byers PVC Pipe Catalog.**

For additional information on 4-D Wrought Iron, contact Byers Division Offices in the cities listed below.

The maintenance and operating items appearing in BYERS GUIDE were prepared by the Engineering Service Department of

A. M. BYERS COMPANY

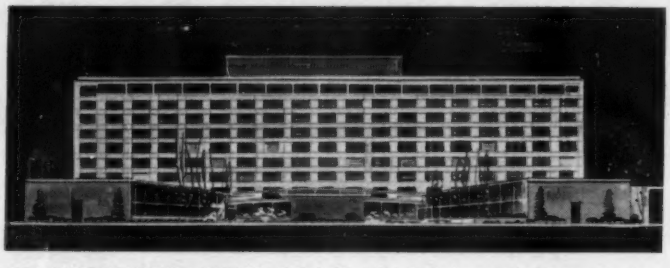
Pittsburgh 22, Pennsylvania

ATLANTA • BOSTON • CHICAGO • HOUSTON • NEW YORK • PHILADELPHIA
PITTSBURGH • ST. LOUIS • SAN FRANCISCO • WASHINGTON, D. C.

4-D Wrought Iron is immediately available and may be obtained through established distributors of Wrought Iron Pipe. Plate, bar, and other flat rolled products may be ordered direct.

Corrosion costs you more than Wrought Iron

Printed in U.S.A.



SHERATON-PORTLAND HOTEL, PORTLAND, ORE. Architect: Church, Newberry, Roehr & Schutte; Consulting Engineer: J. Donald Kroeker & Associates; Mechanical Contractor: J. M. Harder Plumbing & Heating Company.

Climate by Chrysler

Pumps out heat in summer, pumps in heat in winter . . . saves money all year for new Sheraton Hotel

The most complete heat pump system ever installed in a hotel is providing a money-saving answer to the problem of all-year air conditioning for the new Sheraton-Portland, in Portland, Oregon.

The system takes advantage of low local power rates and utilizes available well water. In summer, two 250-hp Chrysler Centrifugal Heat Pumps use the water to absorb heat from indoor air and keep the hotel cool. In winter, the cycle is reversed. Heat is extracted from the water and pumped into the hotel.

Individual Chrysler fan-coil units give occupants of each room complete control over indoor climate. Public spaces are served by Chrysler central air-handling units.

The Chrysler Heat Pump is versatile: It also supplies domestic hot water for the hotel's 300 rooms, and delivers, through boosters, near-boiling water for the kitchen. And the system is economical: It costs less to operate than conventional year-round air conditioning . . . and it even warms the swimming pool without added cost.

Whether your air conditioning requirements are best met by a heat pump or conventional air conditioning, Chrysler has the equipment and technical know-how to do the job better . . . for less. For information on the mechanics or economics of Chrysler equipment, see your consulting engineer, or write today.

CHRYSLER AIRTEMP

Airtemp Division, Chrysler Corporation, Dept. V-129, Dayton 1, Ohio
In Canada: Therm-O-Rite Products, Ltd., Toronto, Ontario

For more facts circle 548 on Reply Card

THE 1960 PLANT MAI & ENGINEE

CONVENTION HALL, PHILADELPHIA

JANUARY 25-28, 1960

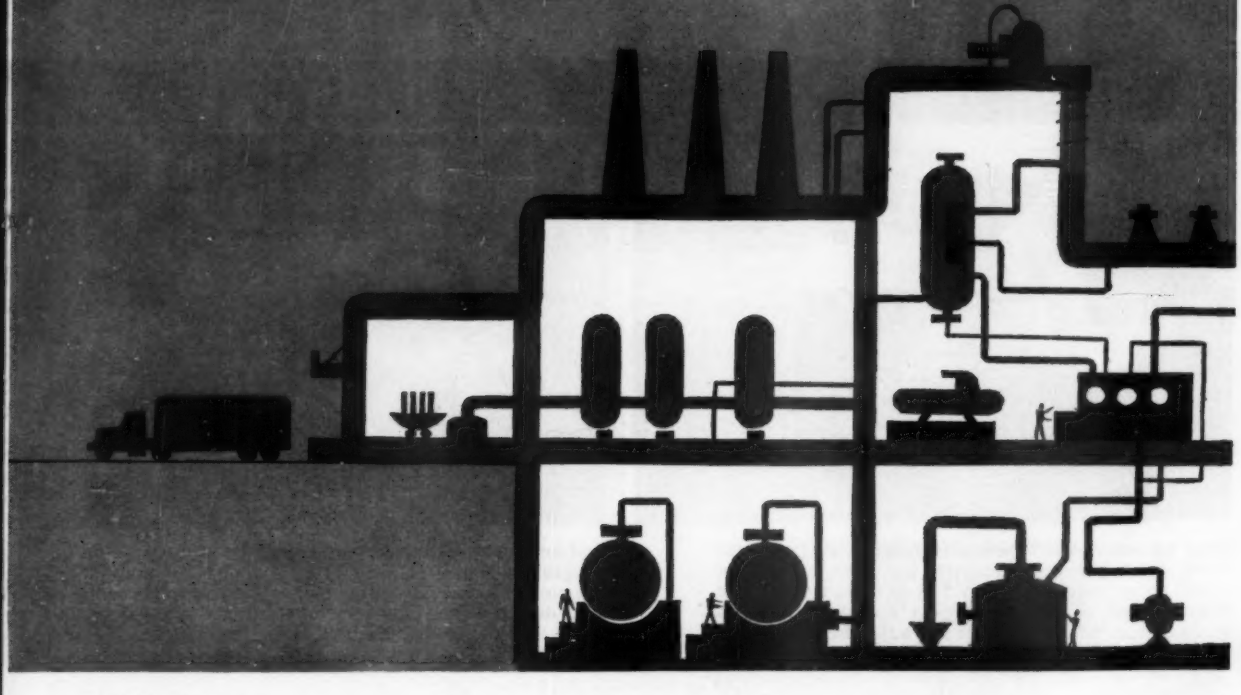
Four idea days that will stimulate your thinking and freshen your approach to the job of increasing plant efficiency. Almost 400 leading manufacturers will show you machines, equipment, supplies and services covering every aspect of plant and maintenance engineering. All under one roof, at one time! See and compare, discuss your problems with experts!

At the Plant Maintenance & Engineering Conference you'll hear top experts discuss your problems. For show registration tickets and conference information, write to:

Show Management, Clapp & Poliak, Inc., 341 Madison Avenue, New York 17, N. Y., MUrray Hill 4-3432.

NATIONAL MAINTENANCE ENGINEERING SHOW

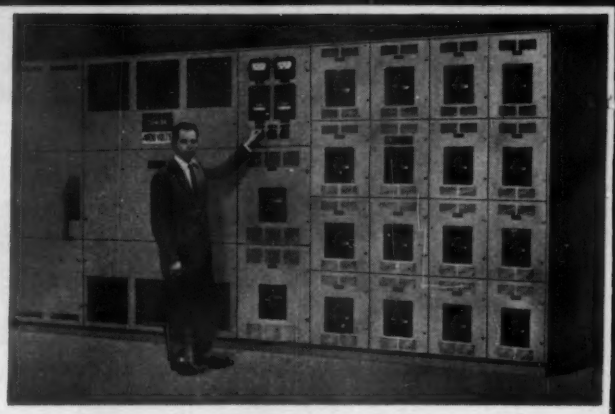
DON'T MISS THE CONFERENCE



I-T-E Model ETI circuit breakers...
specially designed for motor control centers

GET THE EXTRA ADVANTAGES OF THESE OTHER

Most advanced 600 v power switchgear . . . with new I-T-E K-LINE circuit breakers. Pulldown handle and stored energy mechanism give 5-cycle closure every time. Means longer contact life, greater operator safety, less maintenance. Wide load range trip adjustment saves later modification. Closed door disconnect for safety.



Best coordinated secondary unit substations. Only I-T-E designs and builds complete secondary unit substations in one plant. Engineers work closely together. So you benefit from extra time and money-saving features: better coordinated designs, easier assembly, pretested performance, and delivery to match your own construction schedule.

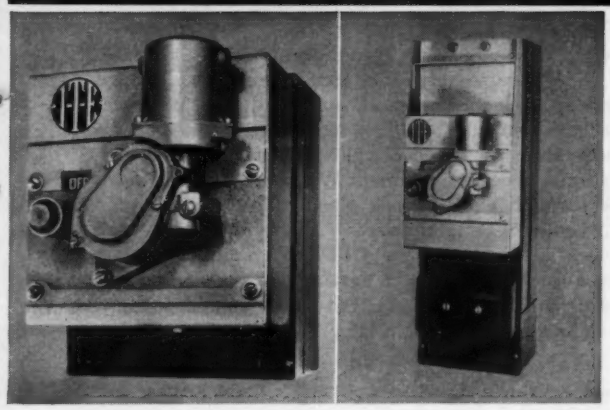
Motor circuits need this PINPOINT PROTECTION

I-T-E Model ETI circuit breakers are special purpose . . . with advantages that motor circuits need for complete protection. Unlike regular circuit breakers, they can be easily set to an instantaneous rating about 11 times normal full load current. This gives instant protection against overload damage without nuisance tripping. Regular breakers are preset at instantaneous ratings as high as 100 times full load current.

Look what this difference means. Take the example of a 20 amp breaker recommended for use with a motor starter for a 500 horsepower 440 volt a-c motor. Full load current is 7.5 amp. An ordinary breaker would have an instantaneous trip setting of 500 amp—many times the desired value. A high resistance fault or short circuit current less than 500 amp could do permanent damage before thermal devices would trip the breaker. But a 25 amp Model ETI breaker in this application would have an instantaneous trip setting of only 87 amp . . . giving instant opening in case of high current faults without nuisance tripping. Model ETI circuit breakers are available in five frame sizes and in ratings up to 800 amp continuous.

I-T-E CIRCUIT BREAKER COMPANY

I-T-E PRODUCTS TOO



TELEMAND* . . . Molded case economy . . . remote control luxury. Now I-T-E molded case circuit breakers are available with new motor operators for remote opening, closing or resetting. Can be easily wired for pushbutton control from a distance. Costs far less than alternative devices. Also permits local or automatic operation.

I-T-E Circuit Breaker Company I-4
1900 Hamilton St., Philadelphia 30, Pa.

- ☐ Molded case circuit breakers for motor control centers
- ☐ K-LINE LV switchgear (600 v)
- ☐ Secondary unit substations
- ☐ TRANFO-UNITS†
- ☐ TELEMAND motor-operated molded case breakers
- ☐ Power switching centers
- ☐ URELITE® circuit breakers
- ☐ Metal-clad switchgear (4.16 and 13.8 kv)

†Tranfo-Unit is a Reg. TM of I-T-E

Name_____ Title_____

Company_____

Street_____

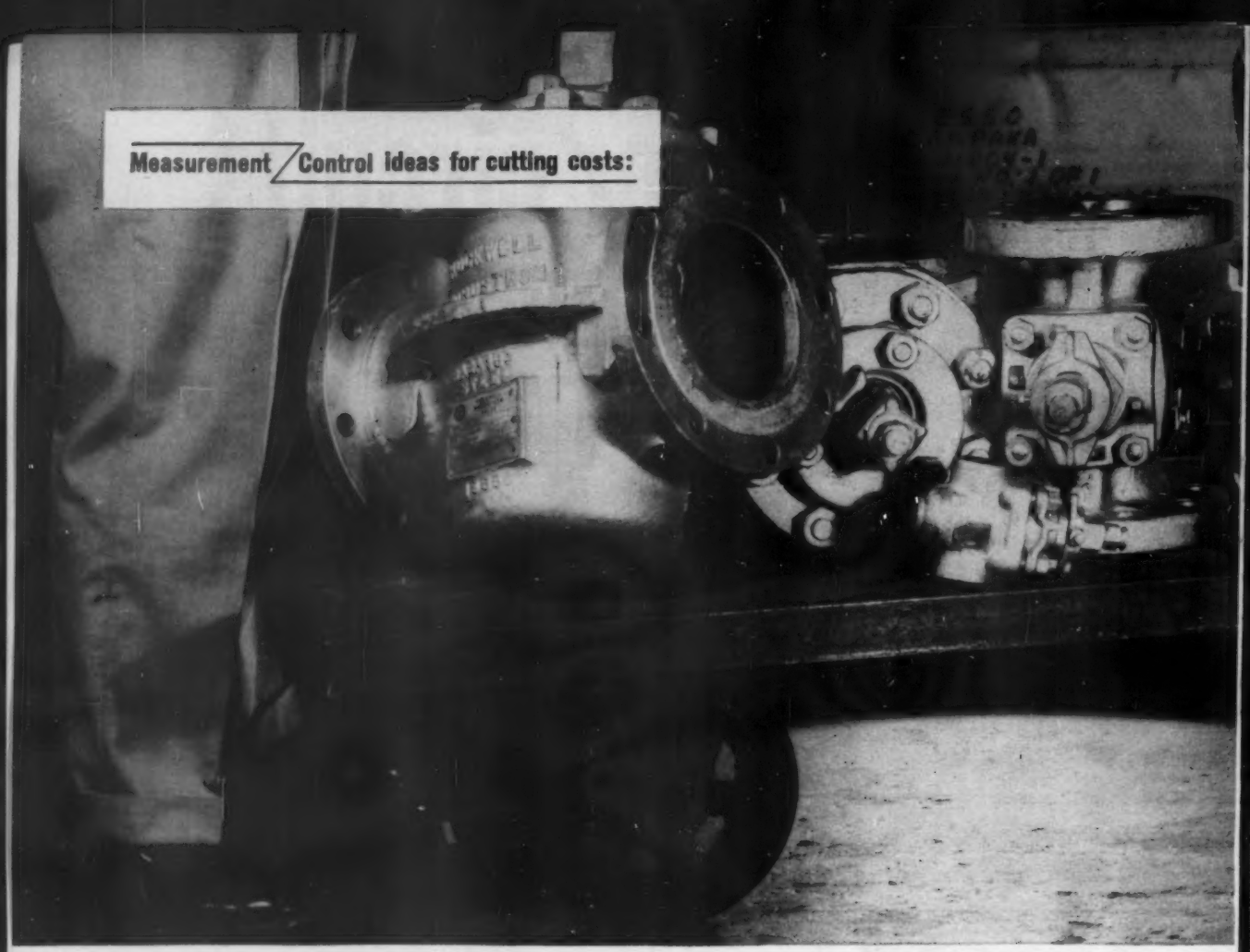
City_____ Zone_____ State_____

SEND COUPON OR WRITE

Get complete up-to-date information on I-T-E equipment

**An I-T-E trademark*

For more facts circle 550 on Reply Card



"If these valves last six months WE'LL SAVE MONEY"....

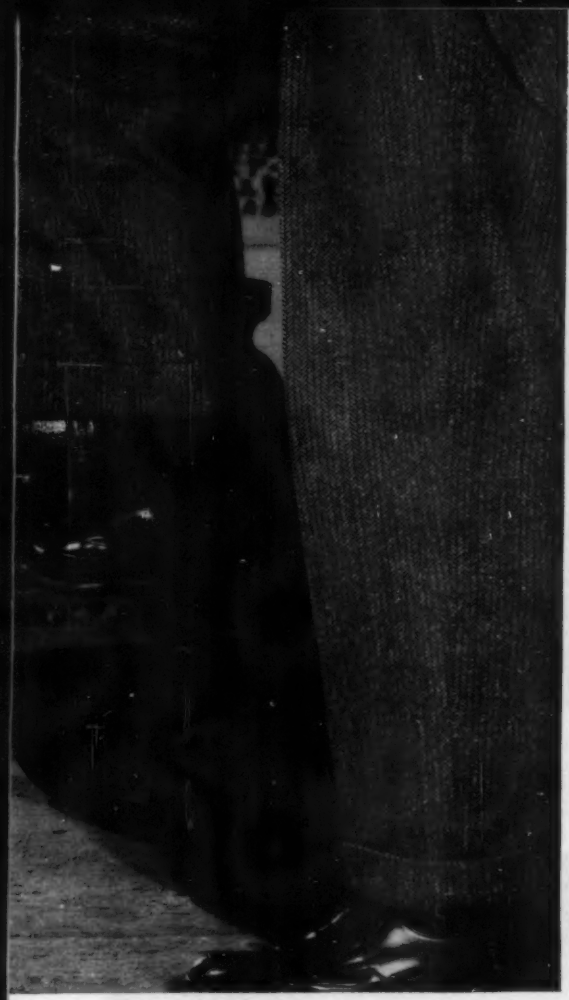
. . . That was the comment of the chief engineer at a plant where pickling acids used to clean steel sheet literally ate the guts out of valves in 4 to 6 months. A Rockwell field engineer recommended a test installation of Rockwell-Nordstrom lubricated plug valves because the fully protected seats and dependability assured by lubrication had proven so effective on even tougher services. *The test valve is still in continuous use after two years.* The test valve led to a full valve replacement program for both the difficult and "easy" services too. It has been an immediately profitable program in terms of direct reduction of down-time and maintenance cost savings over non-lubricated type valves.

This is just one example of the many ways Rockwell field engineers are helping save time, money and material in a wide variety of manufacturing and process plants by suggesting new and better methods of measurement and control. These field men represent Rockwell's experience as the world's largest manufacturer of measurement and control products. Wherever liquids or gases flow through pipe in your plant, this experience can help you cut cost and improve quality. Why not have a Rockwell field engineer visit your plant to explore new approaches to cost cutting through improved measurement and control. Send the coupon today—there's absolutely no obligation.

ROCKWELL

The leading single source for Measurement / Control products and ideas

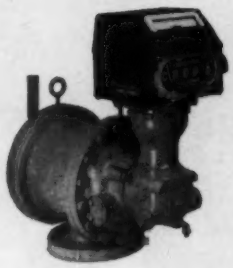
For more facts circle 551 on Reply Card



"IN-PLANT" METERING:

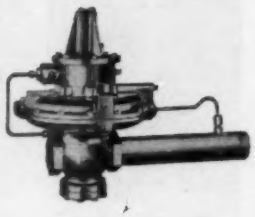
LIQUIDS AND GASES

Rockwell gas and liquid meters, properly applied, can improve quality control, sharpen cost control, and prevent waste in almost every plant department. A Rockwell Field Engineer can help you find *where* meters will cut costs . . . and Rockwell has a complete line of meters to measure practically anything that will flow through pipe.

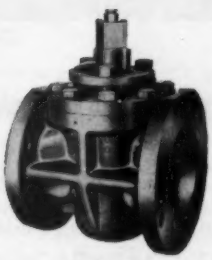


CONTROLLING PIPED MATERIAL:

LIQUIDS AND GASES



More efficient control of all the material flowing through pipes in your plant is a positive step in cutting costs. There are new applications and new ideas for using gas pressure regulators and valves that will stop wasteful, inefficient, and dangerous handling of fuels, production fluids, and products. A Rockwell Field Engineer can show you *where* and *how*.



HOW MUCH COULD YOU SAVE?

There is hardly a plant of any kind—including yours—where the right application of the right measurement and control methods and equipment won't produce savings many times the modest cost involved. It will cost you nothing to have a Rockwell Field Engineer *show* you. Simply send the coupon below, now.

SEND COUPON NOW!

MEASUREMENT & CONTROL DEVICES

another fine product by

ROCKWELL

Rockwell Manufacturing Company, Pittsburgh 8, Pa. Dept. MC2M

☐ Please have a Rockwell Field Engineer call me for an appointment.

Please send literature on ☐ Controlling gas pressures; ☐ Valving gases, liquids and slurries; ☐ Measuring liquids; ☐ Measuring gases.

I am concerned primarily with ☐ Light & Heavy Metal Fabricating ☐ Basic Chemical Production ☐ Chemical Processing ☐ Food, Drugs & Tobacco ☐ General Manufacturing Operations ☐ Petroleum Processing

☐ Others: _____

Name: _____ Title: _____

Company: _____

Address: _____

City: _____ Zone: ____ State: _____

"Buffalo" Air Cooled Condensers Handling Propane Gas on Refrigerated Liquid Propane Storage Spheres. Photo—Courtesy of Rust Engineering Co.

WITH NEW "BUFFALO" AIR COOLED CONDENSERS

Some time ago, "Buffalo" began field testing Air Cooled condensers and Air Cooled Liquid Coolers of completely new design. But we withheld the advertising of this unique product until we could talk in terms of a **field-proven** unit. Now, we can.

"Buffalo" Air Cooled Condensers have been installed on a wide variety of applications. Reports from actual users now prove their highly efficient and economical operation. They provide complete freedom from operating difficulties. Service requirements are reduced to an absolute minimum.

These field reports prove beyond all doubt that the new "Buffalo" units have eliminated the difficulties common to most air cooled condensers.

Only "Buffalo" Air Cooled Condensers Bring You All These Advantages:

VERTICAL DISCHARGE—is not affected by wind velocity—holds compressor on line.

EASY-TO-INSTALL—shipped as factory-assembled packages. Lifting eyebolts simplify rigging.

LOW SILHOUETTE—the No. 1000 unit is only 76" high.

OPPOSED BLADE BY-PASS DAMPER CONTROL AVAILABLE—provides close modulating control not possible with parallel-blade dampers—or with "flooded coil control". Saves expensive refrigerant.

UNIT CASINGS—heavy-gauge galvanized steel construction insures durability, long life.

AMPLE CAPACITIES—Standard sizes from 7½ to 100 tons based on 120° condensing temp. 40° suction, 100° ambient. Larger sizes for special refrigerant, liquid or gas cooling applications available as factory-assembled packages.

Applications of "Buffalo" Air Cooled Condensers include air conditioning and steam condensing . . . also jacket water cooling of diesels, package compressors, gas turbines, electronic tubes, power transformers, process liquids, heat pumps.

For the utmost in reliable performance, new "Buffalo" Air Cooled Condensers are your best choice. Call your nearby "Buffalo" engineering representative for complete facts. Or write us direct.

"Buffalo"

BUFFALO FORGE COMPANY Buffalo, N. Y.

Buffalo Pumps Division, Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING • AIR CLEANING • AIR TEMPERING • INDUCED DRAFT • EXHAUSTING • FORCED DRAFT • COOLING • HEATING • PRESSURE BLOWING

For more facts circle 552 on Reply Card

COURT DECISIONS —a summary of legal findings of interest to the plant engineer

Prepared by Albert Woodruff Gray

Lost Profits

CONTRACT WAS made for the installation of a powder arrester system in a hardwood manufacturing plant in Georgia. In the performance of the work a heavy boom, mounted on a truck operated by the contractor, was negligently allowed to fall on vital machinery and equipment in the flooring company's plant. As a consequence the plant was idle for 3.325 days.

In the suit brought for the money due for the installation of this equipment, the loss of profit that occurred as a consequence of this shutdown was set up as a counterclaim. As to the right of the manufacturer to recover these prospective profits, the Federal court said:

"Prospective profits are necessarily somewhat uncertain and problematical but in cases where damages are definitely attributable to the wrong of the other party and they are only uncertain as to amount, they will not be denied though they are difficult of ascertainment.

"In the proving of compensatory damages certainty in the fact of damage is essential. Certainty as to the amount goes no further than to require the basis for a reasonable conclusion. The injured party is not to be barred from a fair recovery by impossible requirements. The proof of future profits by the evidence of past profits in an established business gives a reasonable basis for the conclusion." Court brief 170 F.S. 537, Georgia, June 6, 1958.

Overtime Pay

VIOLATION OF THE overtime provision of the Fair Labor Standards Act was claimed by the United States Secretary of Labor against an engineering firm in Missouri.

Contracts had been made by this firm for the construction of buildings in which the Civil Aeronautics Administration would later house some of the newer types of high frequency radio equipment.

In this construction work, the Secretary of Labor contended these employees were engaged in commerce within the meaning of the Fair Labor Standards Act and that the overtime provisions of that statute must be met by their employer.

Holding here that these employees were within the purview of this law, the court quoted from a United States Supreme Court decision, in which was outlined the test adopted by the courts in such instances. "The question whether an employee is engaged in commerce within the meaning of the present act is determined by practical considerations, not by technical conceptions.

"The test is whether the work is so directly and vitally related to the functioning of an instrumentality or facility of interstate commerce as to be in practical effect, a part of it rather than an isolated activity. Repair of facilities of interstate commerce is activity 'in commerce' within the meaning of the act.

"We think the work of improving existing facilities of interstate commerce involved in the present case, falls in the same category." To this the court added, "It is inescapable that these engineering employees were engaged in commerce within the meaning of the Fair Labor Standard Act." Court brief 170 F. S. 310, Missouri, February 10, 1959.

Duty to Warn

INSTRUCTIONS were given by the Baltimore, Maryland, City Health Department to a workman to cement a dirt cellar floor approximately 20 by 30 ft in size.

The man, unfamiliar with work of this type, followed the calculations of an acquaintance for the quantity of material, ordered the ready-mixed concrete by telephone and directed the driver of the truck to pour it into a chute leading to the cellar.

With a rake and other tools he spread the concrete at an even depth of about four inches. After five hours at this work and the greater portion of the time on his hands and knees, with no protection from the wet cement, he was the victim of third degree burns.

No warning of this danger had been given him. The concrete had simply been poured into the cellar as he directed and he had signed the delivery slip. He sued the concrete manufacturer for his injuries on the ground that it was the duty of the manufacturer to warn him of these dangers, and having failed to do so, was consequently liable for the damage.

"We may assume," said the court, in denying the workman a recovery, "that an action for negligence will lie against the supplier of a commodity for failure to warn of a latent danger attendant upon a proper use of the commodity supplied, at least where the danger is foreseeable and probable. We may also assume that knowledge of dangerous properties may be imputed to the manufacturer or supplier.

"The test is one of reasonableness under the circumstances. A supplier is under a duty to make his product reasonably safe for its intended use with ordinary care but a duty to warn of inherent dangers only arises where there is a reasonable probability of injury unless warning is given.

"Concrete certainly is not a new product since it has been in common use in every kind of construction project for at least 50 years." In conclusion, the court added, "We think it would be as unreasonable to require every supplier of concrete to warn of its caustic properties as to require an electric company to warn of the danger of touching uninsulated wires. If the danger is not patent it is at least in the realm of common knowledge which the supplier may properly take for granted." Court brief 151 Atl. 2d 731, June 8, 1959.

Labor Bribes

FIVE HUNDRED employees at a western oil plant were classified as production workers and over-the-road truck drivers. Wage increases and pension plans had been demanded by the production workers. When the demands were refused, the workers struck.

At a meeting of the officers of this oil company and representatives of the striking workmen, it was agreed that the strike would be ended by a back to work movement, the production workers to overthrow their strike leaders and return to their jobs. Also, it was agreed that $5000 should be paid to these labor union representatives who were effecting this settlement.

A check for that amount was mailed to the son of one of the labor representatives, deposited by him to the credit of a fictitious and non-existing organization and checks distributing this fund were mailed to each of these representatives.

Under the Labor Management Relations Act, it is provided: "It shall be unlawful for any representative of any employees who are employed in an industry affecting commerce, to

COURT DECISIONS

receive or accept or to agree to receive or accept from the employer of such employees any money or thing of value," with a penalty of a fine of not more than $10,000 or imprisonment for not more than a year, or both.

Four of these labor representatives were tried and convicted of a violation of the statute and from that conviction they appealed.

Sustaining the conviction, the Federal court said: "They knew the objects and purpose of the plan. During the progress of this plan they received $5000 circuitously conveyed to them under suspicious circumstances. They retained the money, accounting for it, if at all, in a manner to conceal the purpose for which and the sources from which it had been received.

"The proven facts and the attending circumstances unerringly point to the conclusion that these men had guilty knowledge and the attending circumstances are not only consistent with that hypothesis but are inconsistent with the hypothesis that they were without guilty knowledge." Court brief 240 Fed. 2d 253, January 21, 1957.

Discharge Justified

BEFORE A grievance committee of shop employees one employee's name came up for consideration at nearly every meeting during the year. Complaints against him were based on his attitude, his belligerence and his failure to make any effort to get along with the rest of the people in the place.

At the request of this committee that the employee be discharged, the president of the company commented, "Each person has a right to be on this earth. This employee should stay."

At the last committee meeting of the year this employee made charges, based on dishonest statements of facts, against the president of the company and was discharged. The National Labor Relations Board ordered his reinstatement and the employer appealed.

This provision of the Board's reinstatement order was stricken out by the United States Court of Appeals. They said: "It is apparent that the trial examiner simply swept under the rug the mass of evidence of this employee being obnoxious, hard to get along with, a trouble maker and antagonistic to his superiors. He was subject to discharge for legal acts and the fact that he was engaged in union activities was a coincidence which did not render the just cause invalid." Court brief 265 Fed. 2d 225, April 9, 1959.

Group Price Discounts

AUTOMOBILE PARTS, sold throughout the country, were marketed to distributors under two forms of rebate contracts. In one plan, discounts were granted on the amount of annual purchases, varying from no allowance on sales of less than $1800 to a maximum of 20 per cent from the list price on a volume of $100,000 or more.

Under the other plan, sales were made to cooperative groups on the same discount basis as was allowed individual distributors. Joint cooperative groups of this sort have for the past two years been the object of criticism by the Federal Trade Commission.

These groups, the Commission charged in this instance, demand and receive discriminatory prices through their combined buying power. Suppliers, the Commission has complained, who sell on a quantity discount basis, base their discounts on the combined purchases of all the members of such groups whereas competitors, acting individually, are granted allowances only on their individual purchases.

The effect of such methods, asserts the Commission, tend to destroy or prevent competition between these group buyers and individual jobbers.

In sustaining the cease and desist order of the Commission, the Federal Court said:

"It is apparent that the growth of joint purchasing groups among the distributors can tend only to further lessen competition and these manufacturers' pricing practices may well foster this tendency. In short, we have here an industry-wide pricing system with decided anti-competitive tendencies." Court brief 265 Fed. 2d 674, April 15, 1959.

Seniority Rights

PROVISION IN a collective bargaining contract stated: "During the slack season, April 15 to October 15, any employee who, according to seniority, would not have steady employment, shall be entitled to a leave of absence and maintain his full seniority rights during that period.

"Any man so described must report to the shop steward not later than 8 a.m. on October 15 and sign the seniority roster in order to protect his seniority. The employer agrees to accept the certification of such shop steward as to availability of such men when called by the employer. Any man failing to report as above specified shall forfeit all seniority rights."

Charges of unfair labor practice made against this employer were sustained by the National Labor Relations Board. The employer's business was a seasonal one and only a limited number of employees enjoyed year-round employment.

The Board held that under this provision of the collective bargaining contract, control over the seniority status of the company's employees was delegated to the union. In the appeal hearing, this order was set aside. The Federal appellate court said:

"During the slack season many drivers of the employer's trucks are laid off and take other employment. Some may never return. Others will return to the company's employ and do not wish to lose their seniority status by reason of the summer layoff.

"To the employer it is important to know how many may be expected to return and be available for work. This section was devised to meet the needs of both the employees and the company. The shop steward is vested with no discretion to determine whose names may appear on the list or the order in which they will be rehired by the company." Court brief 266 Fed. 2d 552, May 14, 1959.

Solicitation of Customers

IN A RECENT suit an employer sought an injunction against a former employee to prevent him from soliciting the customers of this employer after he had accepted employment elsewhere. This employee had worked under no written agreement nor had he made any promise to this former employer that prices or customer lists should be held by him in confidence. Addresses of these customers were available to all the employees at any time.

"Had the employer desired, he could have tied this and other employees by contract not to use this information," said the court, in its decision in favor of the employee. "No employee was bound by a written contract. There is no general rule classifying information acquired over years of employment as confidential to the employer.

"If these circumstances," asserted the court, "could be held to warrant the relief sought against this former employee it would open a field in which the courts would be called upon to regulate mere conduct in practically all the avenues of trade." Court brief 182 N.Y.S. 2d 637, November 12, 1958.

NOW A GLASS LINED CORROSIVE RESISTANT VITRIFIED CLAY PIPE

AMVIT JOINTED GLAS-GLAZ

Here's a new product that has everything:

- VITRIFIED CLAY PIPE IN LONGER LENGTHS
- THE FACTORY MADE, MECHANICAL AMVIT PLASTIC JOINT
- GLASS LINED INSIDE AND OUT
- COSTS NO MORE THAN ORDINARY PIPE
- CORROSIVE AND ACID RESISTANT

You can make important savings in first costs and in operating costs with remarkable new Glas-Glaz pipe. It has everything, is quick and easy to install, and will outlast other materials. This low cost, superior product is available due to new manufacturing techniques and research developments.

LOWER MATERIAL COSTS — Glas-Glaz costs substantially less than metals, alloys, or lined materials commonly used for corrosive service.

LOWER INSTALLATION COSTS — Glas-Glaz can be installed quickly and easily. The joint, made from plasticized resins of polyvinyl chloride, is on the pipe delivered ready for installation. All you do is push the ball and socket together.

LOWER MAINTENANCE COSTS — Glas-Glaz is acid resistant, resists abrasions and corrosion, will not rot, rust, or deteriorate.

Plant and process engineers can specify Glas-Glaz and *be sure of performance.* It's the only clay pipe designed for industrial and commercial use wherever highly corrosive wastes are encountered.

Write for a descriptive folder now.

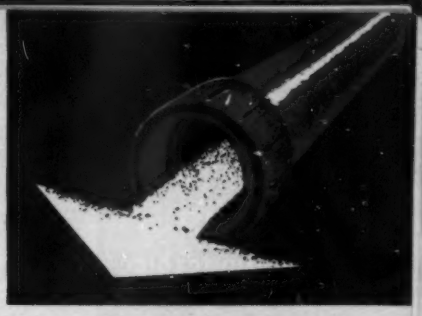
SINCE 1848

AMERICAN

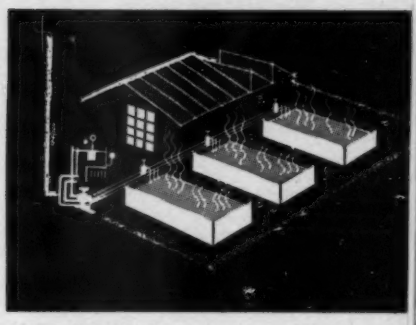
American Vitrified Products Company

NATIONAL CITY BANK BUILDING
CLEVELAND, OHIO

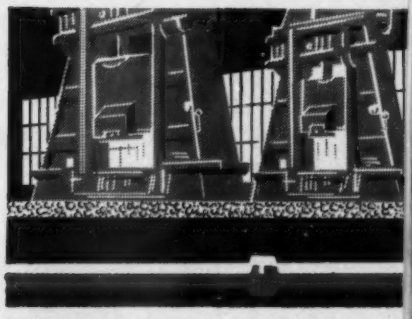
For more facts circle 553 on Reply Card



SMOOTHER—Nothing can adhere to the glossy, glass surface of Glas-Glaz. The design of the Amvit Joint assures that the pipe is self-centered for self-cleansing action.

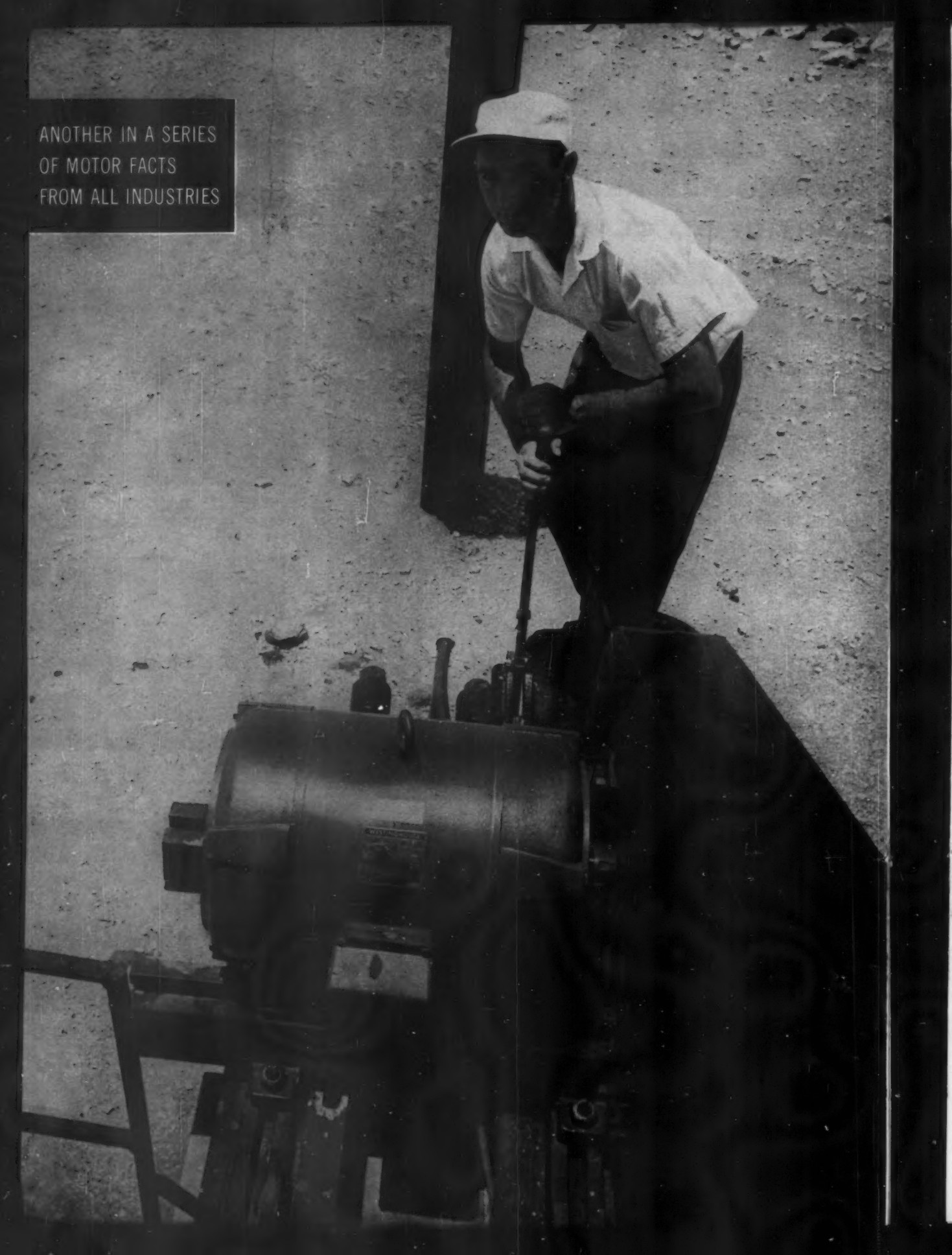


ACID RESISTANT—The interior surface of Glas-Glaz is of impervious chemically resistant glass. It positively cannot be harmed by sewage, chemicals, or hot liquids, and is especially adaptable for industrial wastes and chemical lines.



STRONGER—Amvit Joint is pliable, permitting reasonable deflection without leakage. The resiliency of the Amvit Joint permits it to absorb shocks or vibrations that cause failures in a more rigid type of joints.

FOOLPROOF JOINT—Amvit Joint is a true mechanical joint made from plasticized resins of polyvinyl chloride. It is a compression type joint on the ball and socket principle. When the joint is made, the surfaces of both bell and spigot rings are in constant high compression.


ANOTHER IN A SERIES
OF MOTOR FACTS
FROM ALL INDUSTRIES

Sand... heavy rain... extreme heat...

Nothing stops These Westinghouse Life-Line A Motors

dependably driving oil well pumps in Odessa, Texas district of The Atlantic Refining Company, 24 hours per day, 7 days a week!

"Here's an application," says A. P. Johnston, production engineer at The Atlantic Refining Company, "where we must have continuous motor operation . . . sometimes for as long as 18 months . . . with virtually no maintenance or repair. Many of our pumping stations are remotely located, automatic and unmanned. Any stoppage or motor failure would result in the loss of several hundred barrels of oil. Motor repairs in the field are prohibitive in cost. We must have *complete* motor reliability and that's exactly what we get from our Westinghouse Life-Line® "A" motors."

How about you? Got a really tough motor application which you can't afford to pamper? Then ask your Westinghouse sales engineer to show you how the dependable Life-Line "A" pays for itself through reduced maintenance and repair. Or write to Westinghouse Electric Corp., P.O. Box 868, 3 Gateway Center, Pittsburgh 30, Pennsylvania.

J-22055-R

YOU CAN BE SURE...IF IT'S Westinghouse

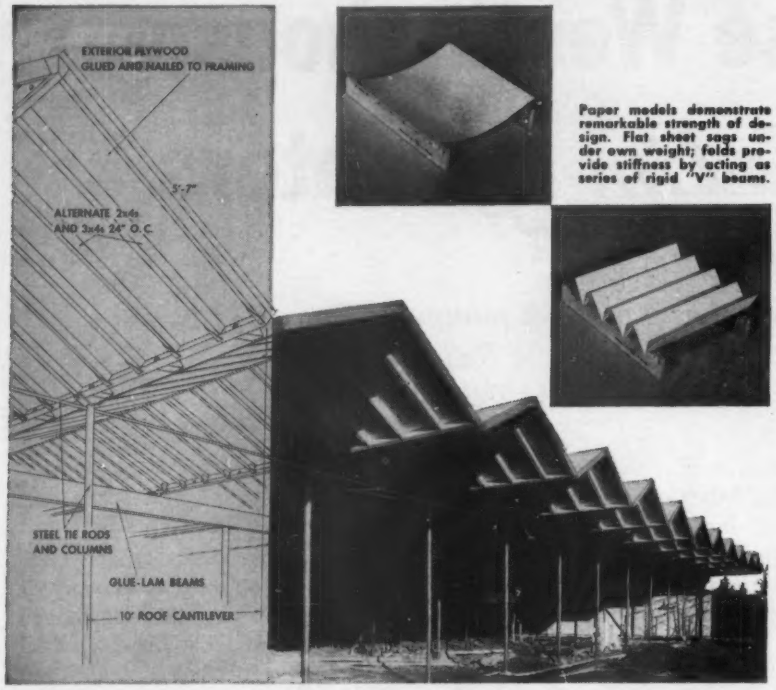
On this pumping unit, the 15-hp Life-Line "A" motor operates in an atmosphere of damaging dust, sand and moisture. Despite continuous, heavy-duty service, motor has never suffered any overheating since first installed. Prelubricated bearings of the Life-Line "A" eliminate periodic greasing . . . keep lubricant in . . . dirt out.

For more facts circle 557 on Reply Card

A REPORT TO MANAGEMENT ON HOW

Industry cuts costs with FIR PLYWOOD

ROUTE TO:
- ☐ ENGINEERING
- ☐ PRODUCTION
- ☐ SALES
- ☐ PURCHASING
- ☐ MAINTENANCE
- ☐ CONSTRUCTION
- ☐ _____


EXTERIOR PLYWOOD GLUED AND NAILED TO FRAMING
5'-7"
ALTERNATE 2x6s AND 2x4s 24" O.C.
STEEL TIE RODS AND COLUMNS
GLUE-LAM BEAMS
10' ROOF CANTILEVER

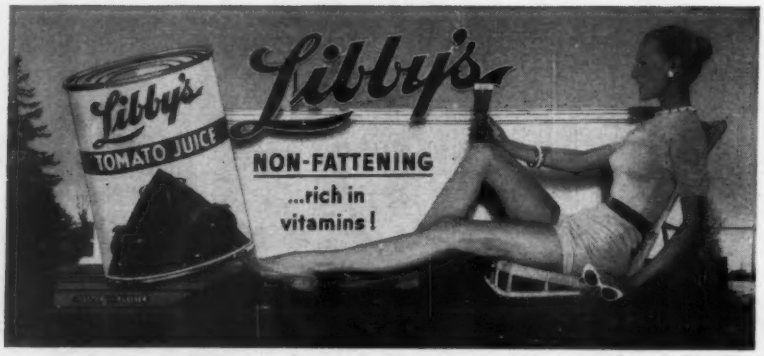
Paper models demonstrate remarkable strength of design. Flat sheet sags under own weight; folds provide stiffness by acting as series of rigid "V" beams.

Strength from shape—not mass—is the key to this precisely engineered fir plywood folded plate roof. The plywood plates are stiffened with light lumber framing and act in pairs to form a series of giant "V" beams.

Stronger, yet less expensive (by 20 per cent or more) than conventional joist or truss construction, fir plywood folded plate roofs are ideal for warehouses, stores or other buildings that require large, clear floor areas. Depending on design, the system permits clear spans of 50 feet or more.

In the 14,000 sq. ft. shopping center shown here under construction, plywood roof components were fabricated on the ground using common labor, and installed by a 6-man crew in less than nine hours. In-place cost came to less than 80c per square foot.

Delicate electronic equipment, produced by Edgerton, Germeshausen & Grier, Inc., Boston, is shipped to AEC test sites in Eniwetok in light yet rugged fir plywood containers that provide maximum protection at low cost.



Giant overlaid plywood cut-outs add real impact to outdoor advertising. This giant bulletin produced by Foster & Kleiser, San Francisco, for Libby's is being rotated in key West Coast markets. The plywood cut-outs are light, strong, and easy to fabricate. The medium density resin-fiber overlay is fused to the panel during manufacture to form a smooth, durable surface for quality paint finishes. The overlay is completely waterproof and has a slight "tooth" for better paint adhesion.

FOR MORE INFORMATION about fir plywood—its uses, properties and advantages—write

DOUGLAS FIR PLYWOOD ASSOCIATION

TACOMA 2, WASHINGTON

—an industry-wide organization devoted to research, promotion and quality control

Always specify by DFPA grade-trademarks

DFPA TESTED QUALITY

For more facts circle 558 on Reply Card

Puritan's Engineered Maintenance reduces floor-cleaning and sealing problems for The American Thread Company

A Puritan representative demonstrates correct use of the Advance Floor Machine "Convertamatic" high speed combination scrubber-vacuum.

"We're saving 30% on costs... and our floors stay in better condition longer"

"ENGINEERED MAINTENANCE gets my vote! By applying technical know-how, furnishing adequate supervision, and providing proper supplies and equipment, Puritan has helped us lick a difficult sanitary maintenance problem.

"Frankly," says J. C. Collins, Utility Foreman at The American Thread Company, Sevier, North Carolina, "I didn't think we could ever overcome it, but Puritan showed us how. Now our custodians are proud of the job they are able to do."

The American Thread Company was faced with the problem of paraffin being tracked from area to area throughout its large, modern mill. With the installation of Puritan's ENGINEERED MAINTENANCE program, this condition has been reduced to a minimum with a very considerable saving in cost.

Systemized sanitation

Your plant has its own special requirements and desirable level of sanitary maintenance. The ENGINEERED MAINTENANCE program Puritan recommends for your company is prepared for your individual needs. A specially trained Puritan representative surveys your buildings personally. On the basis of this on-the-scenes report, a team of Puritan specialists prepares day-to-day, week-to-week and month-to-month procedures.

They set these up for you on an engineered basis...train your janitors and porters...call regularly to review progress and provide further training as needed.

This entire program costs you nothing

Puritan means exactly that. No strings. As a user of Puritan sanitary maintenance products you receive the service free.

Meanwhile you are not tieing yourself down in any way. Nationally used Puritan products are competitively priced and fully guaranteed. You are not asked to sign any long-term contract. You pay nothing extra—either directly or indirectly. The burden of proof is upon us.

Frees your time at once

ENGINEERED MAINTENANCE starts to take nuisance details off your hands from the very first day. You have additional hours to devote to management responsibilities... doubly important today when increased investments in labor, materials and equipment place a premium on efficient operation. ENGINEERED MAINTENANCE is a tested method of controlling sanitary maintenance...conveniently ...surely...economically.

A good way to start

Send for "ENGINEERED MAINTENANCE." This new technical booklet shows you precisely how Puritan helps you achieve trouble-free maintenance...cut your company's costs...save your own time.

© COPYRIGHT 1959 PURITAN CHEMICAL COMPANY

PURITAN CHEMICAL COMPANY

EXECUTIVE OFFICES: 916 ASHBY STREET, N. W. • ATLANTA 18, GEORGIA

PLANTS & WAREHOUSES: ATLANTA, GEORGIA • HOUSTON, TEXAS • ST. LOUIS, MISSOURI

For more facts circle 554 on Reply Card

Look how Pittsburgh Fiber Glass Insulation Products provide top thermal and acoustical control... help you save installation time

Check these Pittsburgh Fiber Glass Insulation advantages:

Lightweight—adds only negligible additional weight to any job.

Easily handled—readily cut with knife, shears or die; flexibility provides fast installation.

Dimensional stability—does not shrink or stretch, assuring long-lasting insulation control.

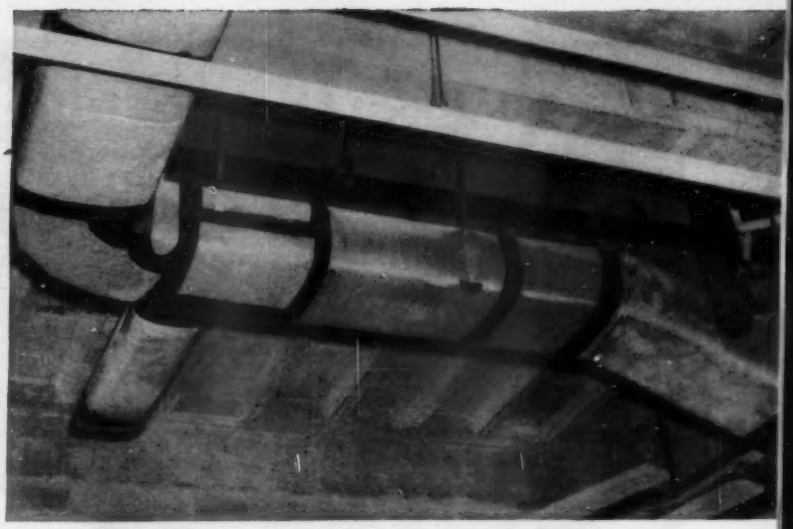
Inorganic—not affected by moisture or heat, will not rot, mildew, oxidize or age; flame resistant, odorless.

Economical—requires less bulk for effective insulation as compared with ordinary insulation; easy application cuts time costs.

FOR ALL-AROUND PERFORMANCE, SPECIFY PITTSBURGH FIBER GLASS INSULATION

In new construction, modernization or routine maintenance, for piping or duct work, insulation products by PPG will give you the quality acoustical or thermal service you're looking for. For more information, call your nearest PPG Sales Office, or write to *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pa.*

Sales Offices: Atlanta, Attleboro, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Detroit, Fort Wayne, Houston, Jacksonville, Kansas City, Los Angeles, Louisville, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, San Francisco and Washington



Pittsburgh Superfine Duct Insulation

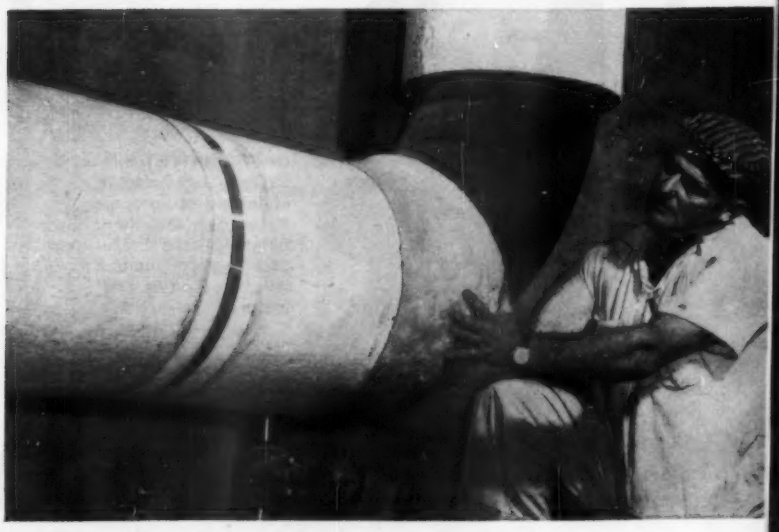
FOR THERMAL CONTROL

wrap-around fiber glass insulation, available in a variety of facings . . . shipped in blanket form . . . lightweight, easily handled . . . clean, non-irritating, odorless . . . good appearance . . . high thermal efficiency . . . flexible, resilient . . . readily fits any desired dimension . . . can be glued, tacked, taped or tied.

Pittsburgh Superfine Duct Liner

FOR THERMAL AND ACOUSTICAL CONTROL

coated with neoprene to prevent air erosion and reduce air resistance . . . low k factor . . . shipped in easy-to-handle lightweight rolls . . . easily cuts to correct size . . . can be glued, tacked or taped . . . can be applied to flat sheet before forming.



Pittsburgh Pipe Insulation

FOR THERMAL CONTROL

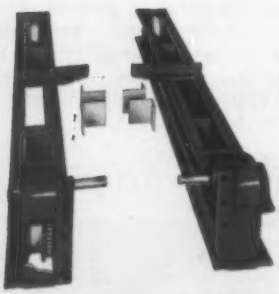
molded into a flexible hollow cylinder, slit along its length to provide quick application to pipes or tubing . . . provided in three-foot lengths, with or without jackets, in nominal wall thicknesses ½", ¾", 1" and 1¾" in all standard IPS and CWT sizes . . . has high thermal efficiency . . . low maintenance.

FIBER PG GLASS PITTSBURGH PLATE GLASS COMPANY

For more facts circle 555 on Reply Card

It Costs Far Less to Build a Crane Locally from Wright Matched Components!

TREAD WHEELS
Made of special car wheel iron with the tread deep chilled to a hardness of 450-500 Brinell. Tapered tread is self-aligning.



END TRUCKS
Welded steel channel construction with heavy steel plate diaphragms. Squaring shaft of ground and polished steel.

CRANE DRIVE UNIT
Consists of electric motor and well-proportioned gear reduction. Solenoid "drag" brake. Size 1—motors up to 2 HP. Size 2—3 or 5 HP motor.

• Now, buy a dependable WRIGHT B-514 Top Running Single Bridge Crane the modern, money-saving way! Here's all you do! Instead of paying shipping costs on a complete crane, order only the matched components—end trucks, crane drive unit, trolley hoist—from the WRIGHT factory. Then, buy heavy I-beam structurals from a local source. This way you realize big savings by greatly reducing freight charges. In addition, WRIGHT also furnishes you with detailed plans for assembly, including a list of essential structural components to be bought locally.

A FEW OF THE WRIGHT B-514 FEATURES:

Controls • Single-speed push button controls are furnished with fluid-drive models, variable-speed push button controls with models without fluid drive. Variable speed controls have five selective speeds for speeding and slowing crane travel.

Fully Integrated Electrical Controls for the B-514 assembled locally with a WRIGHT Hoist and WRIGHT Crane Drive Unit are factory-installed at no extra charge.

Two Timken Roller Bearings to each wheel. Placed in opposition to one another, they compensate for radial and thrust loads.

Complete information about the WRIGHT B-514 Crane and other WRIGHT products is available by writing our York, Pa., office.

WRIGHT CRANES

Wright Hoist Division • American Chain & Cable Company, Inc.

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

For more facts circle 556 on Reply Card

ACCO

WHAT'S JUST AHEAD IN THIS ISSUE?

- PLASTICS played an important part in construction of the pickling plant at the Huntington, West Virginia works of International Nickel Company. It is used for roofing, walls, stacks, fume exhaust hoods and ducts, all exterior lighting and other innovations. If you would like to know more about this imaginatively-designed plant, turn to the next page.

- EFFECTIVE lubrication is possible in only 11 well-planned steps. To find out what they are, turn to page 91. The article outlines the steps which will help you get an efficient lubrication system. Compare them to your present program to see if any changes should be made.

- AN OVERHEAD storage conveyor made it possible for the Hilfinger-Jackson Company to get more plating cycles per day and eliminated the extra handling of plating racks. In fact, with the installation of the conveyor, the company now gets a head start on the day's operation. For the full story, turn to page 96.

- ORDERING a-c motors to standard specifications alone may not give you the best units for the conditions that may be encountered. In the article, beginning on page 98, the author, an experienced designer, comments on various facets pertaining to electrical drives which may have an important bearing on your writing of motor specifications.

- THE NEED for compressed air in a new plant or additional capacity in an established plant requires a decision on the size of the unit or units. Even if the air consumption of each device is known, and an allowance for losses is made, the sizing job is not necessarily complete. The load factor comes into the picture. Percentage of use, or load factor, is taken into account in the article starting on page 104.

- ULTRASONIC cleaning of plant and in-process equipment should be employed properly to get the most from it. Selection of equipment is one thing, type of solutions used is another and applying these two to a particular cleaning job is still another. To get all these in their proper perspective, and get the cleaning job done right, check the recommendations outlined on page 112.

- WANT TO KNOW how other plant engineers are applying plastic valves and piping to solve some formerly vexing problems? A recently-completed survey has been tabulated and summarized—for our edification and yours—and is presented on page 123. Perhaps you, too, can solve some of your valve and piping corrosion problems through the use of plastics.

OUTSIDE . . .

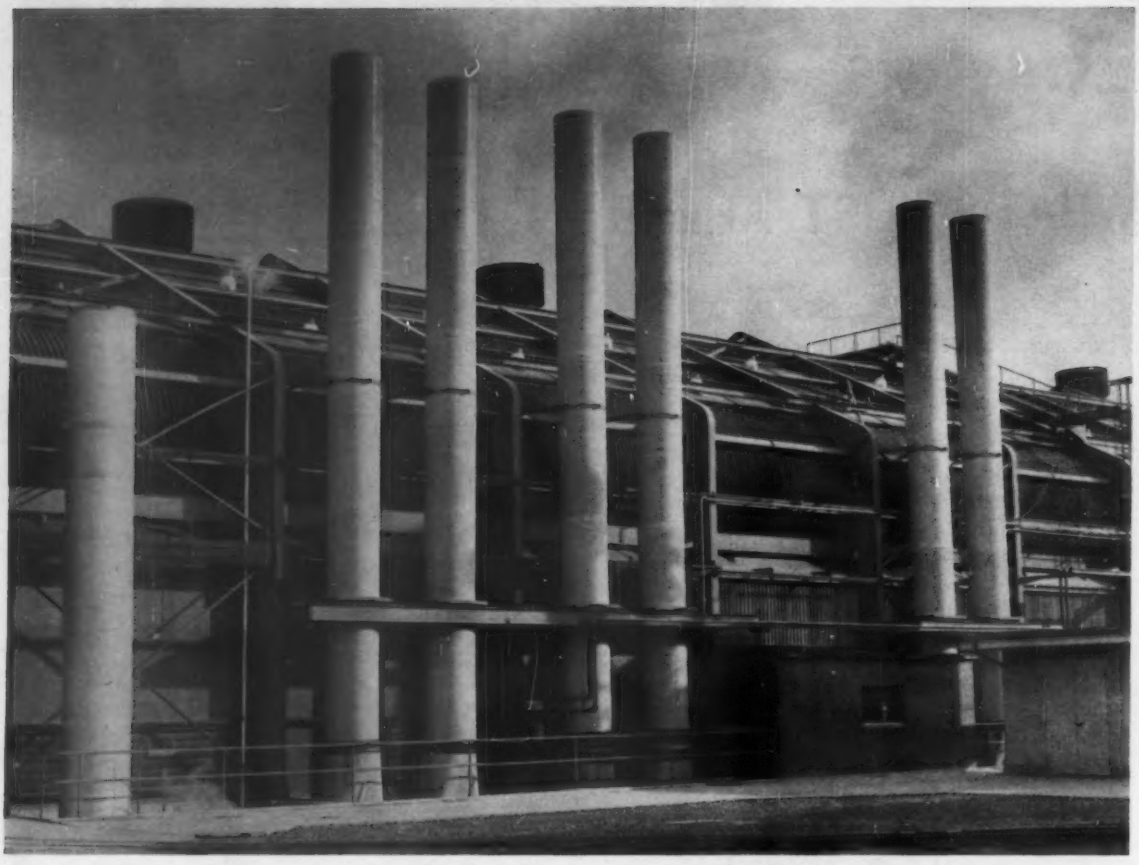


Fig. 1. Exterior view of Pickle House shows plastic stacks, outside structurals, work platform and exterior light fixtures.

INCO'S PICKLING BUILDING FEATURES

Fig. 3. Pedestal control console for crane. Panel on wall controls vent fans.

Plastic stacks, structurals outside the building,

DESIGNED SPECIFICALLY for the pickling of chrome-bearing alloys of nickel, the Cold Draw Pickle House at the Huntington, West Virginia works of International Nickel Company is an excellent example of functional design.

One distinctive feature of the building is the location of the structural members—outside the building shell. In this location, these members are relatively free from attack by the corrosive fumes inside the building.

Reversing the procedure of laying the roof on top of the structurals, therefore, the roof of the pickling building is "hung from the rafters"; the roof being made up of 20 gage corrugated Galbestos panels, coated with plastic after erection.

The structure was designed and furnished by Fireproof Products Co., Charleston, W. Va.

Lighting, Too, Is Different

Four rows of translucent polyester resin panels are installed in the roof to admit daylight. For night lighting, another unusual feature of the building . . . the lights are mounted out-

AND INSIDE . . .

Fig. 2. Overhead crane features work platform (in lowered position). Plastic panels in roof, walls provide daylighting.

FUNCTIONAL DESIGN

lighting through the roof . . . . help make building unique

side the building, directed through the translucent panels that are used for daylighting. Aside from two lights mounted on the overhead crane, there are no lighting fixtures inside the main building area. Further daylighting is provided by a row of translucent plastic panels set into each wall of the building.

Provision for the maintenance of the roof, the lighting fixtures outside the building, and the ventilators mounted in the roof has been made. . . both inside and outside. A track-mounted platform, seen at the extreme right of Fig. 1, spans the roof, conforming to its shape. This platform can be moved the length of the building, to give access to any part of the exterior.

Inside the building, Fig. 2, a work platform has been incorporated into the design of the overhead crane. Pivoted at its center, the platform can be raised to conform to the inside contour of the building, by lifting the center toward the peak of the roof. Locking pins hold it in place during use . . . it can then be lowered out of the way. Raising and lowering of the walkway is done through the roof openings at the ventilating fans.

The overhead crane itself, particularly its controls, continues the functional design in the building. Equipped with twin trolleys and hooks, the primary use of the crane is handling long lengths of alloy rod and tubes, in and out of the various baths in the pickling line. It can be controlled from two locations . . . a pendant control hangs from the crane, permitting the operator to move with the load; a console control is set just outside the main control room, permitting the operator to load and unload materials into the pickling baths from a single location, near the control room. An interesting

feature of this latter method is the use of a signal light. As the crane moves over the center of each bath, a signal light goes on, under the far end of the crane. At this signal, the operator stops traverse of the crane, and lowers the load into the bath, assured that the load will drop in the center of the tank.

Fume Removal System

Pickling acid solutions contain mixtures of nitric, hydrofluoric, sulfuric and muriatic acids, at operating temperatures varying from 120 F to 190 F. This variety of acids demanded careful attention in the design of the fume removal system incorporated in the building.

Fumes from the acid tanks are captured and pulled through side takeoff, slot-type hoods in a balanced air system. Exhaust rate of air is 200 cfm per sq ft of tank surface; actual slot velocity is 2600 fpm. From the takeoff slots, the fumes are pulled into main exhaust headers, each of which handles 27,000 cfm, at a pressure of less than one inch of water for each exhaust fan. In the headers, water sprays scrub the fumes prior to their entry into the exhaust fans and stacks.

The hoods and ducts are constructed of glass-reinforced thermosetting polyester resin. The entire installation was fabricated and installed by Heil Process Equipment Corporation. The stacks are unusual . . . each 42 in. in diameter and 45 ft high, they were fabricated of the same reinforced plastic as the hoods and ducts.

The exhaust fans in the headers are either rubberlined steel or Type 316 stainless steel. The roof ventilators are neoprene coated; they are operated only when "lifts" of material in process are being drained or transferred.

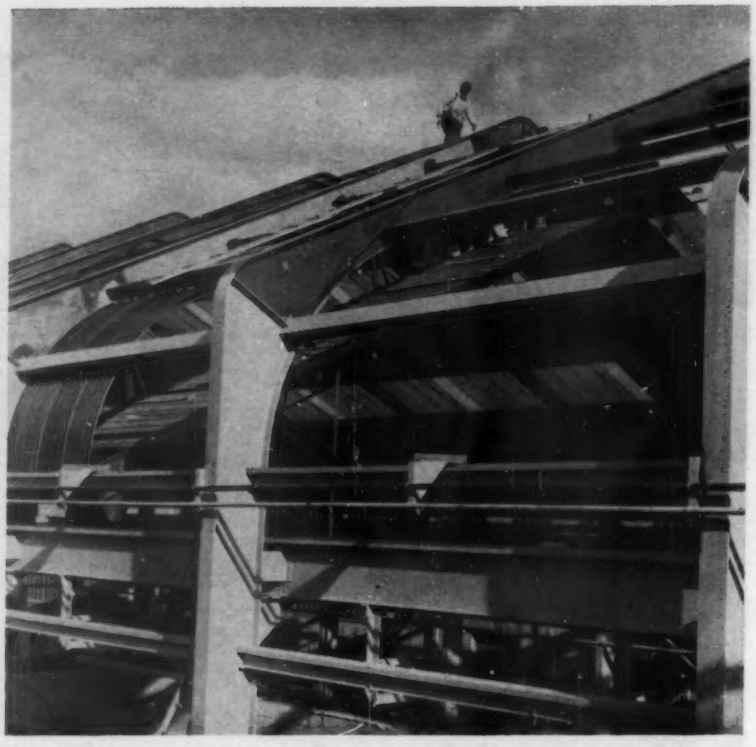


Fig. 4. Construction photograph shows roofing panels and structural framing.

Pickling and wash tanks are lined with rubber or polyvinyl chloride, depending on their contents. This lining is protected by an additional brick lining. They are set into a basin, six feet below floor level, which is lined with a glass mat membrane coated with acid-proof mastic, bonded to the reinforced concrete walls and floor of the basin.

Drain trenches in the bottom of the basin are of reinforced concrete construction, coated with acid-proof mastic carbon brick. This particular installation was made by Ralph V. Rulon, Inc. **End**

Fig. 5. Pickling tank takeoff hoods and main header are of all-plastic construction. Headers are fitted with water sprays.

ELEVEN STEPS TO EFFECTIVE LUBRICATION

Review of 11-point checklist will tell if your present system is "up to snuff" or if adjustments should be made

By BRUCE M. DUNHAM, Technical Consultant, Sun Oil Company

TO BE EFFECTIVE, plant lubrication must be a carefully planned program, not an occasional, possibly haphazard, function. Plant operating men can use the following 11-point checklist to set up a planned program or to study their present one.

Step 1—Assign Responsibility

Several departments—such as plant engineering, maintenance, and production, to name just a few—may have a part in a planned lubrication program. They will operate best if they know their exact role in it, so it is important to define clearly each department's job. First, over-all authority and responsibility for the program should be assigned to one person. Usually this will be the manager of the plant engineering department or, in smaller plants, the maintenance supervisor.

Next, spell out detailed individual duties for every person in the program so that a complete organization can be charted. If job descriptions are used, lubrication duties should be added to them as assigned.

Finally, see that everyone taking part in the program has a clear understanding of the organization and knows about any later changes in it.

Step 2—Set Up Central Information

A wealth of information on lubrication can usually be found in a plant, but it is often kept by individuals or departments for their own use. For instance, literature on new lubricating systems may be in the plant engineering department; lubricant cost figures in accounting or purchasing; and, manufacturer's recommendations in maintenance. Such information will be much more valuable if it is kept in a central place, with one person given full responsibility for maintaining these records.

In addition to information already available, more may be gathered by studying actual lubrication in the plant. Petroleum suppliers will usually assist with lubrication surveys. Applications where downtime is especially expensive should be studied first to get immediate benefits from the program.

In general, the central file will include:

(a) A description or list of all lubrication points; how often each is lubricated; the lubricant used; and the individual responsible for lubrication.

(b) Information on the quantities of lubricants used; by type of lubricant; by department; and application.

(c) Lubricant performance data; how long it lasts; how efficiently it lubricates.

(d) Information on new lubricants and methods.

New equipment, relocated machines, or other changes should be noted in the central file. A continuing restudy of actual applications, taking a few at a time, will help to verify the file information and will do away with plant-wide surveys after the first one.

Fig. 1. Central information file is key point in a good lubrication program. It should include schedules and lubrication charts, description of methods, and performance data.

Step 3—Prepare Lubrication Charts

Lubrication charts should be prepared for all applications, showing the points to be lubricated, the type of lubricant, and the method of applying. These charts should be based on manufacturers' or petroleum suppliers' recommendations.

The charts may be filed and sent out as needed, or they may be kept near the lubrication point. Either place is satisfactory so long as changes in lubricant or

TRAINING PROGRAM TO INSTRUCT SUPERVISORS

Session I—Discuss importance of lubrication. Present actual cases from own operations showing problems caused by improper lubrication, etc. Compare costs of good lubrication program with costs or repairs and downtime.

Organization and responsibilities in lubrication program. Discuss part played by each department and/or individual. Emphasize role of supervisor in creating interest in his own group. Hold a "brainstorming" session to get ideas for keeping employees aware of importance of lubrication.

Explain how central file information can assist supervisors in solving lubrication probems.

Explain how lubrication charts and schedules are prepared and how they should be used.

Session II—Show how lubricants are refined to do a specific job.

Explain properties such as viscosity, viscosity index, oxidation resistance, pour point, color, flash point, etc. Explain significance and relative importance of each.

Explain fundamentals of lubrication. Friction. Types of bearings. Gear lubrication.

Explain use of hydraulic fluids or any other special petroleum products.

Session III—Discuss proper handling and storage of lubricants. Emphasize cleanliness and safety.

Discuss methods of application. If possible let each supervisor show how he would explain an application method to an employee.

Discuss maintenance, purification of lubricants.

Fig. 2. Here is a suggested three-session course for supervisors. After training, they should instruct their groups.

Fig. 3. Lubrication cards may be filed at a central point and sent out as needed or kept near the point of lubrication.

in the method of application are promptly recorded on the chart.

Step 4—Prepare Lubrication Schedules

A definite lubrication schedule, based on manufacturer's and petroleum supplier's recommendations, should be set up for every application. Written notices may be used to remind the person who is to do the lubrication, especially if it is done infrequently. Some written record should also be made when the job has been done.

For example, reminder cards may be kept in a tickler file by date so that they can be sent to the person who is to do the lubrication. When the job is done, he initials the card and returns it to the file. Such a system, maintained by a clerk, is an excellent control method with a minimum of paperwork for shop personnel. Lubrication charts may also be sent with the reminder cards.

In larger plants, the reminders may be handled by automatic accounting equipment.

Step 5—Train Personnel

Each individual should be trained for his lubrication duties. He should have the basic knowledge to do his job, plus information on any new lubricants or methods that will affect it.

Training may be needed at all levels, especially when the program is getting started. Key persons, including the Program Director, may study by correspondence or at a local technical school or college. Lubrication training should also be given in apprenticeship programs, supervisors' courses or meetings, and so forth. Literature or films from petroleum suppliers or trade groups may be a part of such training. A suggested three-session course for supervisors is outlined in Fig. 2.

When supervisors are trained, they, in turn, should be able to instruct their own groups.

Step 6—Standardize Lubricants

Selecting the right lubricants is an important part of a planned program. A carefully developed set of standard specifications, backed up by "operating standards," should be set up for each lubricant. These will show not only the properties that the lubricant should have, but also the things that the lubricant must be able to do. A typical set of specifications and operating standards for an anti-leak hydraulic oil are shown in Fig. 5.

Reducing the total number of different lubricants should cut costs in storage and lubrication methods, and may permit bulk buying. Petroleum suppliers can often help, for instance, by suggesting multipurpose lubricants.

Step 7—Study Storage and Handling Methods

When the number of different lubricants has been cut to a minimum, handling and storage should be studied for possible cost savings. Fewer lubricants may mean smaller inventories and less storage space. Bulk storage may also cut costs. One eastern Pennsylvania plant built an outside, underground storage tank that permitted bulk buying. The savings soon paid the construction costs.

Storage areas and methods should also be studied to see that lubricants are kept clean and free from contamination. Personnel should be instructed to avoid contaminating lubricants and to take personal precautions where necessary. For instance, the use of barrier creams for skin protection should be familiar to all personnel handling lubricants.

Lubricant handling is also a possible source for savings. Decentralized storage, the use of lubricant carts, and standardized handling should all be considered to reduce lubrication man-hours.

Step 8—Study Application Methods

Studying application methods may point out ways to cut costs, particularly by reducing man-hours needed for lubrication.

Standardizing application equipment will reduce training costs, simplify maintenance, and may mean that less lubrication equipment is needed. It may also point out places where automatic equipment could be used to lower costs.

Step 9—Isolate Trouble Spots

When a planned program has been in operation, it may become apparent that there are certain "trouble spots" which regularly cause difficulty. These may involve certain types of lubricants, particular applications, etc. These "trouble spots" should be pinpointed so that special attention can be given to them. In larger plants, where a maintenance record shows breakdowns caused by lubrication, these can be used. In smaller plants the information may simply come from talking to operators, maintenance men, etc., who are likely to know the trouble spots.

Step 10—Get People Working Together

A planned program should assist in getting individuals and departments to work together toward effective lubrication. In the beginning, the person responsible for the program may provide much of this coordination. He will, for instance, work closely with plant engineering and purchasing to see that they consider lubrication in buying new equipment. He will point out practices that increase costs, for example, lubricating machines just before major overhauls.

As the program progresses, this kind of coordination should become spontaneous. However, continued lack of coordination in certain areas may point to organizational trouble spots similar to the mechanical ones mentioned above. It is important to isolate these, too, so that they can be corrected. Often clearer spelling out of responsibility, better communications, etc., will eliminate the difficulties.

Step 11—Study New Products and Methods

Part of a planned program is to stay alert for new products or methods which can be used for more efficient lubrication. First, some system, such as a file, should be set up to keep information which is available from trade literature, trade publications, technical literature, catalogs, etc., so that it will be handy when needed. Representatives of petroleum suppliers, often backed by technical specialists, can also offer much information on new products or methods. **End**

Fig. 4. Petroleum suppliers can assist by conducting surveys, advising on lube inventories and application methods.

HYDRAULIC OIL—ANTI-LEAK TYPE

A. Scope: The object of this specification is to set forth requirements governing the procurement and acceptance of two grades of anti-leak type hydraulic fluids.

B. Applications: These oils are primarily intended for application to hydraulic systems where abnormal oil leakage exists and where such equipment cannot be adequately repaired without interfering with production.

C. Requirements:

	Type I	*Type II*
Viscosity (SUS at 100) ASTM D-88	150-225	300-425
Flash Point, minimum, ASTM D-92	325 F	350 F
Pour Point, maximum, ASTM D-97	0 F	0 F
Oxidation Stability ASTM D-943 Mod.*	1000 hr	1000 hr
Anti-rust Protection ASTM D-665	Pass	Pass
Anti-corrosion Protection —3 hours at 215 F with polish copper strip	Pass	Pass

*Without water.

Performance: Supplier shall submit a statement in writing that products to be accepted under this specification shall have been proven to have reduced leakage a minimum of 25 per cent in hydraulic equipment, that they have performed satisfactorily in equipment comparable to that operating in this plant, and that the product does not contain any material which will deleteriously affect equipment or performance.

D. Packing and Marking: Shipment of oil shall be made in steel drums or in tankcars as specified in the Purchase Order.

E. Approved Vendors: *Trade Name* *Manufacturer*

Fig. 5. This is a typical set of specifications and operating standards which have been established for hydraulic oil.

Draw-out circuit breaker is placed on tester platform and connected to transformer secondary through short heavy leads. Handwheel sets test currents up to 6000 amp and built-in timer checks the time it takes circuit breaker to trip.

CIRCUIT BREAKER MAINTENANCE

Field Test Checks Tripping Characteristics

By HENRY S. ORTH, Maintenance Engineer, Esso Standard Oil Company, Linden, New Jersey

OPERATIONAL upsets caused by electrical failures are reduced to a minimum with a preventive maintenance program set up for the electric transmission and distribution system at the Bayway Refinery of Esso Standard Oil Co., Linden, N. J. Started over one and a half years ago, the maintenance program includes a planned inspection of each of the refinery's 60 substations every two years. To date, approximately 60 per cent of the substations have been inspected.

Power for the refinery's electric system is purchased from Public Service & Gas Company and is brought into a central switchyard within the refinery at 27 kv, 3 phase, 60 cycles. From this point, power is transmitted at 27 kv throughout the refinery to substations located at process units. Some of the older process units are connected to a 6.9 kv loop system.

In these various substations, transformers supply utilization voltages at 4160, 2300 and 440 volts. Transformer capacities in these 60 substations range from 1000 to 10,000 kva and the number of removable type circuit breakers installed in each location range from one to 35 units.

Our objectives in setting up an adequate preventive maintenance program for the electrical system were to provide scheduled inspection of substations and transmission system during process turnarounds. We were also interested in developing proper coordination and

operation of relays and development of an adequate system of records to be kept in a central location.

As soon as a process unit is shut down for a planned turnaround, an electrical maintenance crew steps in and begins a systematic overhauling of the substation's electrical gear.

Even though the process operation is shut down for a turnaround, power is still necessary for mechanical work and lights. This power is supplied normally from a turnaround bus that has been built into the newer substations. At older substations, it may be necessary to hook up temporary power or schedule parts of the substation work on weekends.

During this shutdown we take samples of the transformer oil and filter the oil if necessary, completely overhaul all removable circuit breakers, clean out cubicles, check out control circuits and alarms, clean all insulators, bus supports and power busses, clean out the substations and paint when necessary.

Another phase of the preventive maintenance program is testing and checking the operation of protective relays such as time-overcurrent, instantaneous-current, under-voltage and thermal relays used for motor protection. There are approximately 1200 of these relays installed at the Bayway refinery and the engineering department has made a study to coordinate the operation and timing of each relay.

Satisfactory mechanical operation of the circuit breakers is assured after the maintenance department completes their overhaul. They also physically check the relays for satisfactory operation. The next step is to determine the electrical operation of the breakers.

A relay actuated circuit breaker is relatively easy to test as small amounts of current are involved to set up the trip circuit and operate the breaker. However, direct-acting circuit breakers are another problem. In order to trip this type of breaker electrically, it is necessary to pass large quantities of current through the breaker.

To do this job on direct acting breakers, a MULTI-AMP circuit breaker tester is used. Circuitry of the tester includes an output transformer with a variable cross-section multi-tap secondary to provide up to 6000 amp at 2.5 volts with an input of 480 volts. A built-in timer indicates the seconds and cycles at which the breaker trip functions.

Each direct-acting air circuit breaker has a recommended tripping time and trip setting percentage depending upon its rating and circuit application. Breakers are usually tested on each phase for two long-time trippings at both three and five times continuous current rating and for short time tripping at five to ten times.

Tables I, II and III show three typical test records giving the breaker rating, trip settings, tripping time based on manufacturers' curves and resulting seconds for tripping on each phase. These test results are for direct-acting circuit breakers. They have a long-time delay element which is adjustable in the field from 80 to 160 per cent of the continuous rating of the trip coil. The short-time delay is adjustable from five to ten times the trip coil current rating.

In these tests the long-time trip is checked at three and five times the continuous current rating and the short-time trip was tested at 3500 amp which is within the five to ten times rating.

On all tests the breakers are adjusted to operate accurately on the three times rating. An attempt is made to set the breaker trip with a variation of not more than three to five seconds from the manufacturers' curves. The three-four and five cycle results shown on the short time tripping tests are within the accuracy of the test equipment. **End**

Table I. Test record of 400 amp breaker set at 400 amp or 100 per cent current.

Item	Pickup Amp	Trip Time in Seconds Phase A	Phase B	Phase C
Manufacturers' curves	1200	57	57	57
Test as found	1200	90	55	57
Test after adjustment	1200	59	55	57
Manufacturers' curves	2000	33	33	33
Test after adjustment	2000	47	46	42
Manufacturers' curves	3500	Instantaneous		
Actual test	3500	4 cycles		

Table II. Test record of 500 amp breaker set at 800 amp or 160 per cent current.

Item	Pickup Amp	Trip Time in Seconds Phase A	Phase B	Phase C
Manufacturers' curves	1500	90	90	90
Test as found	1500	65	86	111
Test after adjustment	1500	89	95	86
Manufacturers' curves	2500	35	35	35
Test after adjustment	2500	41	41	37
Manufacturers' curves	3500	Instantaneous		
Actual test	3500	5 cycles		

Table III. Test record of 600 amp breaker set at 800 amp or 133 per cent current.

Item	Pickup Amp	Trip Time in Seconds Phase A	Phase B	Phase C
Manufacturers' curves	1800	73	73	73
Test as found	1800	99	61	78
Test after adjustment	1800	74	71	78
Manufacturers' curves	3000	34	34	34
Test after adjustment	3000	31	33	40
Manufacturers' curves	3500	Instantaneous		
Actual test	3500	3 cycles		

STORAGE CONVEYOR GIVES PLANT HEAD START

Now, it is possible to perform five plating cycles instead of three

BY INSTALLING an overhead storage conveyor, the Hilfinger-Jackson Company, Jackson, Michigan, has realized the following benefits: 40 man-hours per week saved, a savings of $500 a month on rack maintenance and two extra plating cycles per day—a 70 per cent increase in plating production on one shift. The company, a subsidiary of Ryerson and Haynes, Inc., plates automobile parts: grilles, chrome trim, etc.

Plating Operations—Before

Formerly, the plating operation was handled in the following manner. Five people were required before to transfer, load and unload the plating racks. Now, only three men are needed to load and unload the parts from the racks. With the storage conveyor, no manual transferring of racks is necessary.

At the start of the day's run, at seven in the morning, the parts—which had been loaded on the 18 rack stations on conveyor 1, will move through the plating cycle. Empty racks from the 37-rack stations on conveyor 2 are loaded and readied for the plating cycle.

Since they could not store any of the loaded racks above the plating machine overnight, it was necessary to remove 95 racks and place them on the floor at one end of the building. This handling would cause quite a bit of damage to the plating racks which would result in a rack maintenance bill of $500 per month.

As the racks are going through the first cycle, the men will start taking the racks stored on the floor and place them on the conveyor. Once they are on the conveyor, they would begin loading them with the automobile parts to be plated.

The plating cycle would be repeated until 1 o'clock in the afternoon. In all, there would be a total of three cycles a day. After the third cycle was completed and the men had removed the extra racks from the conveyor, those left on conveyor 1 would be loaded for the next day's operation.

To eliminate the additional handling steps, the plant manager, W. E. Jenks, and plant superintendent, John McClousky, conferred with Milton McClure, of Rapistan of Michigan, Inc., a distributor of Rapistan-Keystone, Inc., to see what could be done to correct it.

The final decision was the 112-rack storage conveyor. By installing this floor-supported conveyor, the company can now have a total of 125 racks loaded with unplated material and ready for processing the next morning. Eighteen loads are on conveyor 1 and 107 loads are on conveyor 3. In addition, 25 loads will be on conveyor 2 to finish processing.

Before they installed the storage conveyor, they could only operate the plating equipment from 7 o'clock in the morning until 1 o'clock in the afternoon—a total of six hours. Now, it is possible to start the cycle at 5 a.m. and operate until 3 p.m. —a total of 10 hours.

Sequence below shows the four steps involved in transferring the plating racks at the various transfer stations. In Fig. 1, arm brings rack up into position for pick up. In Fig. 2, arm from second conveyor comes up into pick-up position. In Fig. 3, first arm drops back to normal position. In Fig. 4, second arm drops back and carries rack around conveyor.

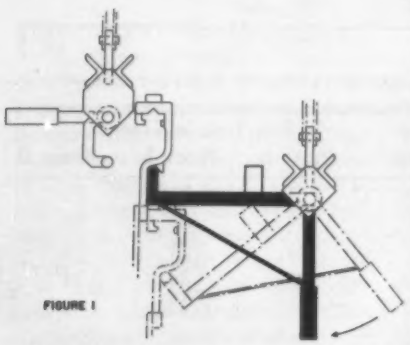


FIGURE 1

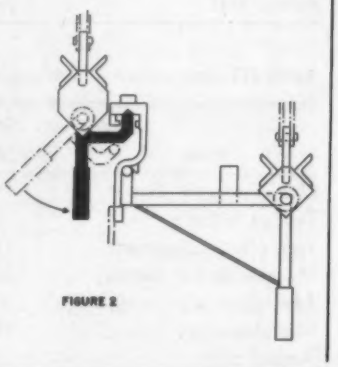


FIGURE 2

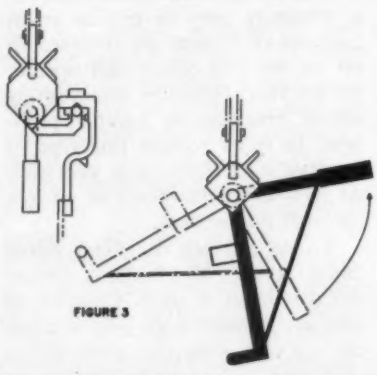


FIGURE 3

Right: By installing storage conveyor, company eliminated extra handling, and possible damage, to plating racks.

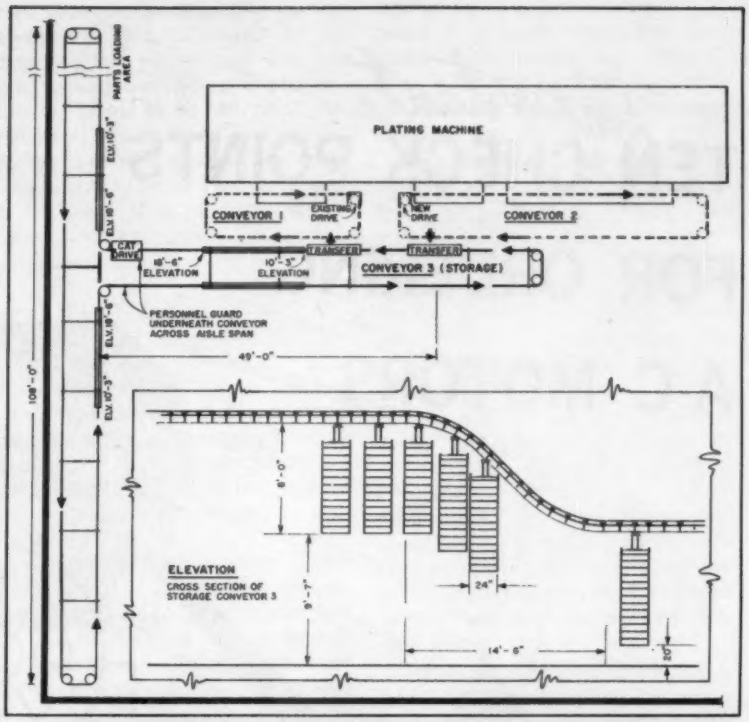
With the present equipment, one of the plant workers starts the first cycle at 5 o'clock in the morning. As he pushes the button, the loaded racks on conveyor 1 transfer to the conveyor section of the plating machine. Loaded racks on conveyor 3 move to conveyor 1 and they are, in turn, transferred to the section over the plating tanks. At this point, conveyor 2 is started to receive parts from the plating machine. The third step is the transfer of the loaded racks from storage conveyor 3 to conveyor 1 and, they, in turn, are transferred to the tanks. The complete plating cycle will take approximately two to two and a half hours, depending on the types of parts being plated.

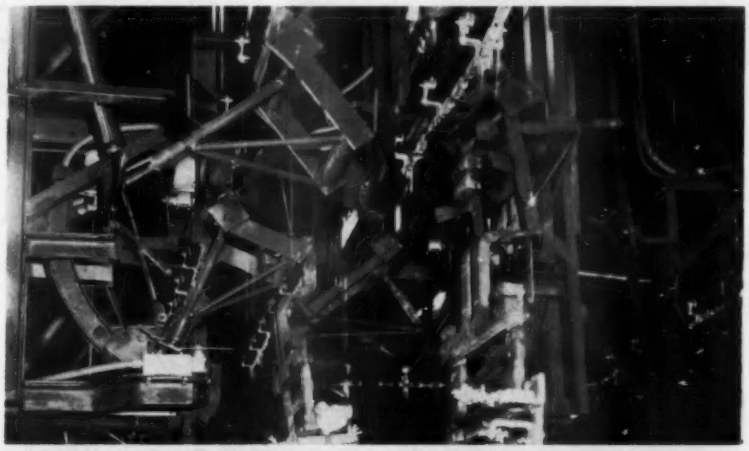
At seven in the morning, when the regular crew reports for work, the plated parts are ready to be removed from conveyor 2.

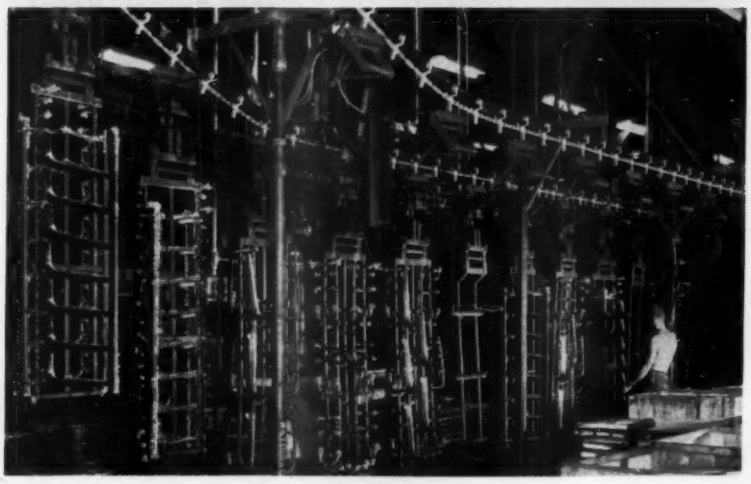
After the parts have been unloaded from this conveyor, the racks then transfer to conveyor 1, where they are cleaned and readied for the next loading.

During the rest of the day, the only racks in use are those on conveyors 1 and 2, plus the racks which move through the various plating tanks.

With this new equipment there is no longer a need for additional floor space for unused racks, there is less rack damage and, finally, the company is able to run two more cycles than was previously possible. **End**







Right: Close-up of transfer mechanism. Lower right: View of storage conveyor, foreground, conveyor 1, background.

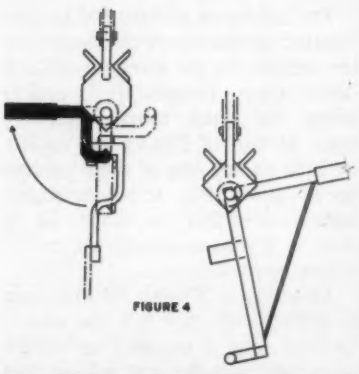
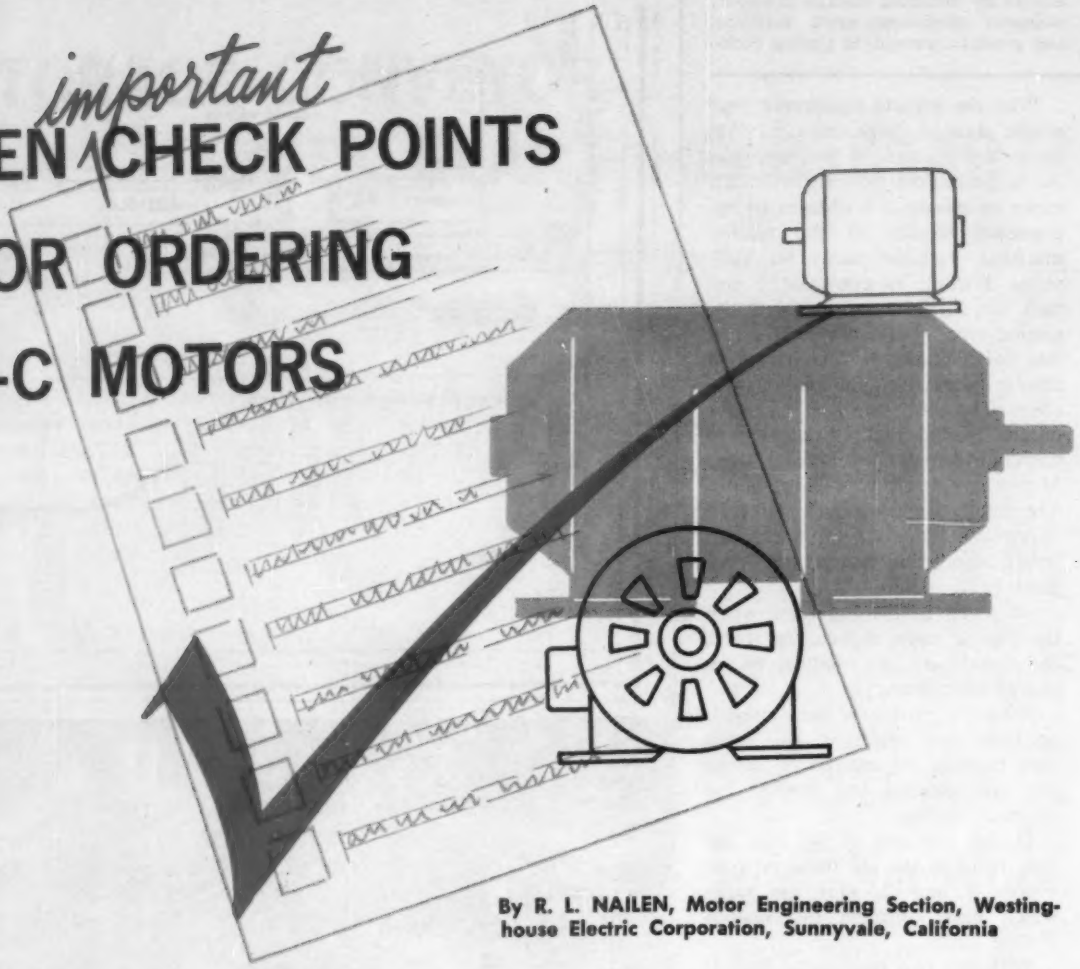


FIGURE 4

TEN important CHECK POINTS FOR ORDERING A-C MOTORS



By R. L. NAILEN, Motor Engineering Section, Westinghouse Electric Corporation, Sunnyvale, California

Editor's Note — Specifying motor horsepower, speed, frame size, voltage, frequency and phase does not necessarily supply enough information to insure a successful drive application. Based on wide experience in motor design work, the author gives you 10 additional check points to consider. A review of each of these should become part of your standard practice when ordering a-c motors.

MUCH HAS BEEN written of the importance of adhering to published standards in specifying motors and other electrical equipment. The advantages of following the standards of NEMA, AIEE and ASA are well known, but it should be recognized that such standards cannot cover everything that may be required of an a-c motor.

In the first place, there are too many individual and local sets of conditions to be included in any industry-wide standard. Secondly, standards define certain design characteristics and dimensions but do not always tell which ones to specify to do a particular job.

Here is a convenient checklist for keeping track of those motor features which are least defined by published standards or are most often omitted or vaguely stated when motors are ordered. This is important as motors are frequently ordered in the expectation of getting some feature which is standard in the users organization but which may be special to a particular motor manufacturer.

Correcting such misunderstanding when manufacture of the motor is nearly complete or after the motor is installed causes lost time and expense. Relying on the manufacturer's clairvoyance can be costly.

☑ TORQUE REQUIREMENTS

For induction motors 200 hp and smaller, torque-speed characteristics are defined by the standard NEMA design types. Designs B, C, and D being the types most commonly used. Motors of 250 hp and up can be built to any one of these torque-speed curves, Fig. 1, but no standards exist in this size range. To be sure, it is wise to specify the torque values needed.

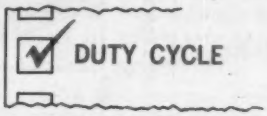
Ordering a 500-hp NEMA type C motor does not tell the manufacturer what is required as NEMA standards just do not go up that

high. Another point worth remembering is that it makes little difference if the motor is designed around torque values that are normal for most applications or around special values for a special application, it will supply these torques only at rated line voltage.

If it should be necessary to start or accelerate its load at reduced voltage, these torques will be reduced. Since extra torque capacity should be designed into the motor for it to do its job under these conditions, the manufacturer should be told if reduced voltage starting or running is to be encountered.

How much torque is required will be determined by load inertia, load torque, duty cycle requirements and by variations in motor voltage. Figure 2 briefly summarizes the values commonly required by industrial and utility loads and these general figures are what the motor manufacturer will work to unless he is told otherwise.

For example, Westinghouse design practice for induction motors above 200 hp is to provide 60 per cent starting torque and 200 per cent breakdown torque. When motors are stated to be for special applications, such as crusher drives, higher starting torque is provided. The only way to be sure the design is adequate is to specify on the order just what torques are needed.



Any motor for plugging, braking, reversing service, frequent or heavy starting duty or intermittent overload should have these requirements spelled out in the order. Special motor design is very frequently necessary.

What is frequent starting? There is no hard and fast answer because motor and load characteristics can be so variable. A run-of-the-mill industrial drive which starts once or twice a day is no problem but one or two starts a minute for 24 hours is probably risky. For purposes of illustration only, Fig. 3, gives a rough idea of the capability of induction motors of open construction for the conditions stated.

Both curves are based on 10-15 minutes of successive starts, followed by an hour or more of running at normal load. The loaded curve assumes motor running at rated hp between starts, with a load inertia of ten times rotor inertia. The unloaded curve assumes the same starting inertia but negligible load between starts.

It should be noted that slower speed machines may usually be started more often than machines of higher speed design for a given horsepower. The slow speed machine will be larger in physical size and will have less heat generated in it because of the smaller spread in rpm between starting and running speeds.

Heavy starting duty is defined as that which may overheat the motor in a single start. The curves in Fig. 4 indicate some of the factors that may cause this. Normal starting conditions are indicated by the curve, Fig. 4a, which indicates a very small load torque requirement as compared to motor capability. When motor torque is left at such normal levels but a load is applied which takes very high torque, Fig. 4b, the motor may come only part way up to speed and stall, or it may crawl up to speed with consequent overheating of both stator and rotor windings.

Similarly, reduced-voltage starting, which reduces motor torque during the accelerating period in proportion to the square of the voltage decrease, may bring the available motor torque down so close to the load values for even normal loading that overheating again results, Fig. 4c.

Finally, any of these three conditions can result in stalling and burnouts if the load inertia is too great for the motor to handle. Figure 5 indicates the magnitude of load inertias that may be safely handled by normal squirrel cage motor designs at various speeds. A common type of high inertia load is the fan, particularly induced draft fans for power plants. Crusher and ore mill often have high inertia.

Fig. 1. Speed-torque characteristics of standard NEMA design induction motors.

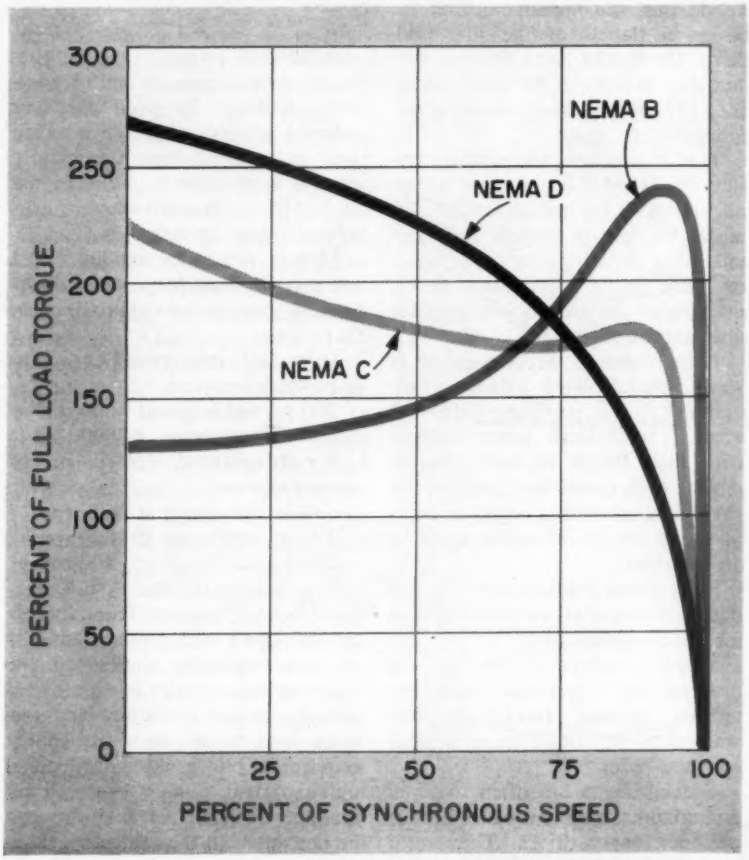
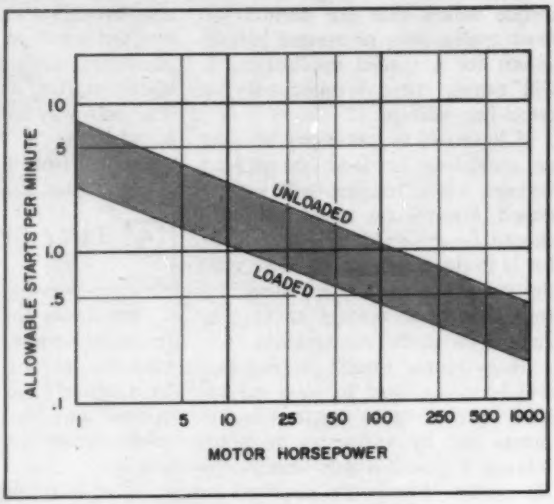


Fig. 2. Motor-torque values required for various types of industrial and utility loads. Motor manufacturer will work to these general figures unless told to design otherwise.

Application	Torque in Per Cent of Full Load		
	Starting	Pull-in**	Pull-out
Pumps and Fans*	40-60	50-100	150-200
Crushers*	100-200	70-100	175-250
Grinding Mills	150-225	100-150	150-250
Rolling Mills	40-60	30-40	250-350
Rubber Mills	125	100-110	225-250
Pumps and Compressors	40	30-50	150
Sawmills	40-80	30-60	200-250
Pulp and Paper Machinery	40-125	50-125	150-225

*These loads are likely to have high inertia.
**Applicable only to synchronous motors. Not refined for induction motors.

Fig. 3. Approximate safe frequency of starting for 1800-rpm open induction motors. Both curves are based on 10-15 min of starting followed by an hour of running at normal load.



The only way to avoid these pitfalls is to be sure of the manufacturers normal design. If required torques or load inertia fall outside these values, tell him so in advance. Load inertia should be stated and if the motor is not direct-coupled the load rpm should also be given so that the designer can refer that inertia back to the motor shaft speed. Where high-torque loads or reduced-voltage starting are used, furnish a speed-torque curve of the load with the order.

Frequently it is necessary to know the time required for the motor to bring the load up to speed for protective relay setting. This can be calculated only if the designer is given this load curve and the load inertia. Starting time is affected by both. There are cases on record where motors failed in the field and had to be rebuilt at great expense because these points were overlooked in placing the original motor order.

CONNECTION TO LOAD

Is the motor to be direct coupled to its load, or is it to drive through belts, gears or a chain? Any of the later methods of drive impose a side pull on the motor shaft and bearings which may overstrain these parts. NEMA standards MG1-6 give maximum recommended belted horsepower for various speeds. In general, the higher the motor speed the lower the horsepower which may be belted.

It is possible to belt ratings outside of these recommendations by special design of the motor parts. To do this, the manufacturer must be given details of the proposed drive. He should know the number and size of belts to be used, motor sheave diameter and direction of belt pull.

This is also true for motors outside the NEMA frame sizes where no standard recommendations are made. Be sure to furnish drive details when ordering a motor for gear or chain drive unless there is no question of the adequacy of a standard motor design.

If the motor is direct coupled, is some special shaft extension required? This is particularly true of vertical solid shaft pump motors with high thrust capacity. Transmitting such thrust requires that the shaft be made with a taper, threads, or a ring key to retain the coupling on the shaft.

Most pump builders have worked out their own shaft extension details for such applications.

When a motor of this type is ordered the applicable shaft extension drawing should be forwarded to the motor manufacturer with the order.

Special shafts are often required on horizontal motors used for blower and machinery drives. The motor supplier should always be given the desired shaft details when the motor is ordered.

DIRECTION OF ROTATION

Failure to properly specify this simple thing causes no end of grief. Rotation should be given whenever ordering a motor of a design which must be unidirectional, particularly when it is to drive a unidirectional load such as an axial blower, centrifugal pump or conveyor.

Motors which are unidirectional and must be built for a stated direction of rotation are approximately these sizes:

Dripproof, splashproof or weather-protected motors.

200 hp and larger at 3600 rpm
600 hp and larger at 1800 rpm

Totally-enclosed fan-cooled or explosionproof.

40 hp and larger at 3600 rpm
125 hp and larger at 1800 rpm
250 hp and larger at 900 rpm

The reason for this is not electrical but mechanical. These motors are equipped with blowers for circulating ventilating air through the machine and in order to obtain reasonable blower efficiency and low noise level at such sizes and speeds requires a blower design which is unidirectional. Such a motor, built for one direction of rotation, can be converted to the other by chang-

ing the blowers. If it is operated in the wrong direction, it is likely to burn out because of lack of ventilation.

When specifying rotation be sure to state which end of the motor is the reference point. What is clockwise rotation to a person looking in one end of a motor will appear as counterclockwise rotation to a person looking in at the other end of the same motor.

BEARINGS

The important point here is to give the manufacturer enough information so that he can select the proper bearing type, size and lubrication system for the motor. Aside from what may be dictated by industry practices or dimensional requirements for NEMA frame sizes, there are four principal factors in bearing selection. These are bearing loading, desired bearing life, ambient temperature, and user preference.

Bearing loading as a factor predominates for vertical motors or for belted motors. When ordering vertical motors, always state what the thrust load is expected to be and whether it is an "up" thrust or "down" thrust, and whether this is continuous or momentary. The terms normal thrust and high thrust are usable but only if both the motor buyer and the seller use the same definition of what these terms mean. There is no NEMA standard.

There is no industry-wide standard as to the bearing life to be expected. This term is used in connection with antifriction bearings, where it is statistically possible to fix a definite minimum life period for a given bearing size under stated thrust load and speed. The bearing manufacturers themselves have no such standard. The allowable axial or radial thrust load on any bearing varies widely with change in desired life, Fig. 6. If especially long life is desired such as the 15 year minimum sometimes specified for power house motors, this should be stipulated when the motor is ordered. It will probably require a larger thrust bearing than normal.

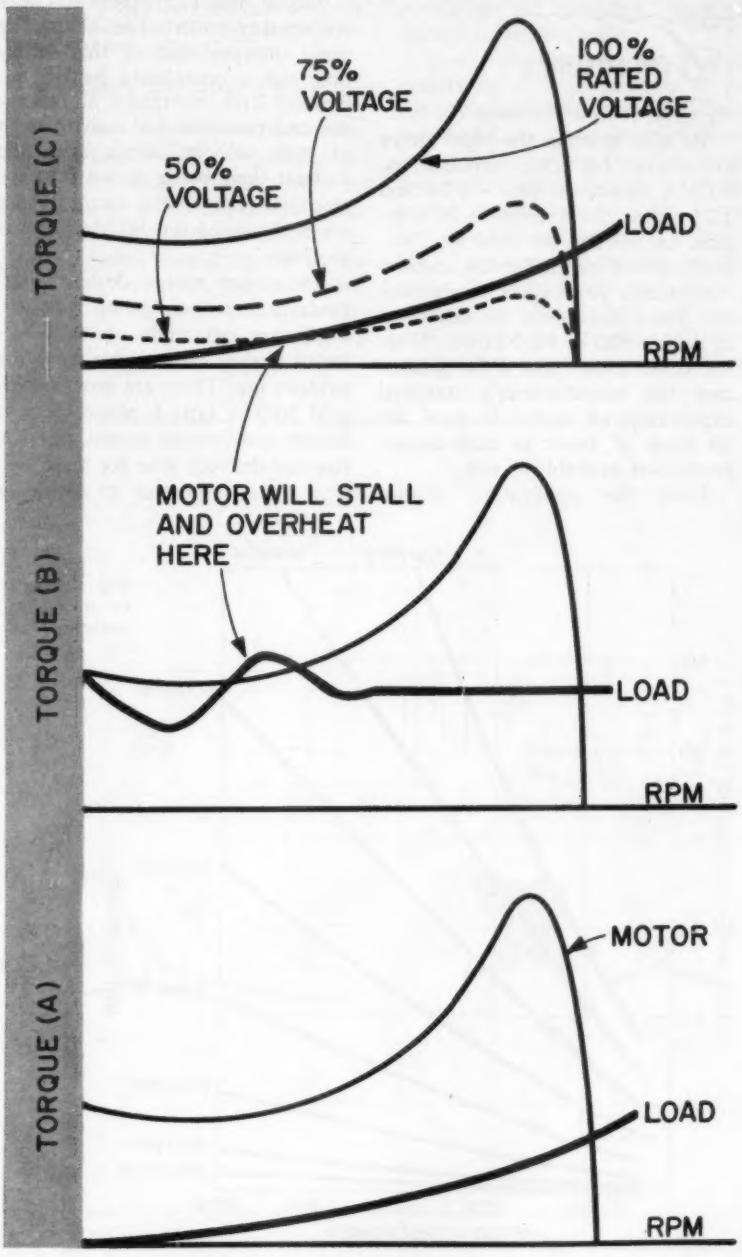
Ambient temperature is important because overheating leads to bearing failures. Antifriction bearings are normally suitable for operation from minus 25 C to plus 85 C. Standard motors are designed for a maximum of 40 C ambient. If temperatures outside this range are to be encountered, the manufacturer must be told what to expect so that he can provide special bearings or bearing lubricants.

Sleeve bearings present a lesser problem but unusual temperatures must be taken into account in selecting the lubricating oil to be used. Cold starting in low ambients, zero C and below, can be taken care of by providing bearing oil heaters to prevent congealing of the oil.

INTERCHANGEABILITY

Is the new motor required to match an existing motor? This match

Fig. 4. Speed-torque curves for NEMA B motor: (a) operation with low load torque on start, (b) high load torque during start and (c) reduced voltage.



may vary all the way from merely meeting the same base mounting dimensions to having complete electrical and mechanical interchangeability leading to an equal sharing of load when the two motors are coupled to a common shaft. Be careful about using the words "similar to" in referring to an existing motor. Tie down exactly what the points of similarity are to be. Give the manufacturer enough data, dimensional and otherwise, on the existing motor so that he will be capable of matching it.

ENCLOSURES

Be sure to order the right motor enclosure for the application. NEMA standards MG1- 1.20 and 1.21 define the enclosures in common use. Order the right type explosionproof motor for the ambient atmosphere you expect to encounter. These conditions are described in Article 500 of the National Electric Code. Don't take it for granted that the manufacturer's standard explosionproof motor is good for all types of vapor or dust atmospheres—it probably is not.

Does the application require screening or ventilating openings to exclude small animals or foreign objects? If so, screens should be called for on the order. Certain types of motors are normally furnished with screens as standard equipment by some suppliers but not by others.

To meet the increasing need for an outdoor motor, a compromise between the open design and the totally-enclosed type, weather-protected enclosures of two types are recognized by the National Electrical Manufacturers Association.

Before June 1957, there was only one weather-protected definition. The usual interpretation of this definition was a completely baffled enclosure, with low intake air velocities and provision for blow-through of high velocity winds and rain without their being drawn into the electrical parts of the motor. These are now considered NEMA type II machines.

There are motor designs, particularly vertical pump motors, which are inherently so well baffled that they are suitable as is for outdoor use. These are now considered NEMA type I. Since there is usually a difference in cost, physical size and delivery time for these two types, it is important to decide in advance which type is needed and to state this decision clearly on the order.

CONDUIT BOXES

When a motor is to be installed on the end of a long transmission line or tied into a weak power system, the motor supply cables may be so bulky that the conduit box space required to make up the connections just won't fit in the box normally supplied for that size motor. The manufacturer has to design the box for the average situation.

When extra box space is needed, motors large and small are often ordered with "oversize" conduit boxes. Now, what is "oversize"? What should the actual dimensions be? Don't make the motor manufacturer guess. Tell him. He knows what is needed normally for the rating but when more space, larger than normal conduit or several conduits instead of one may be needed, such requirements should be spelled out in the order.

Another bugaboo is box location. For all NEMA frame size motors and for most larger ones, the stand-

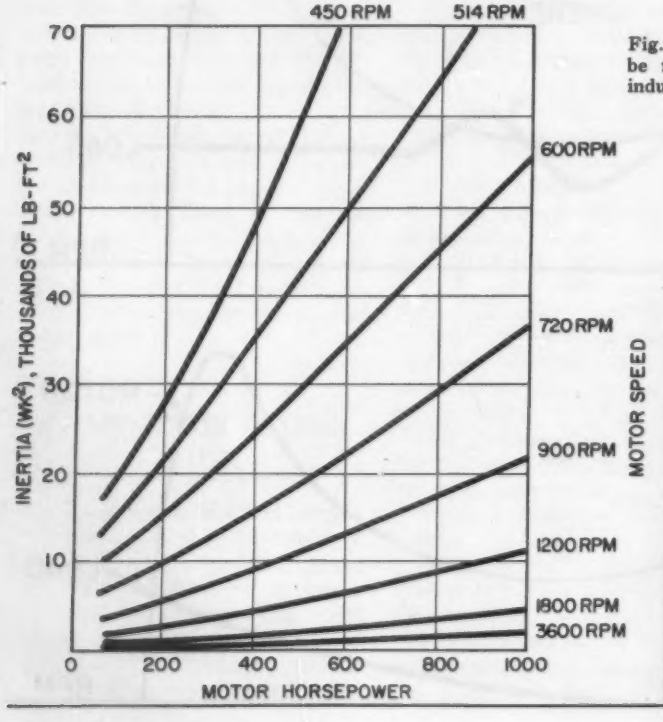


Fig. 5. Maximum load inertia which can be normally handled by squirrel cage induction motors of various speeds.

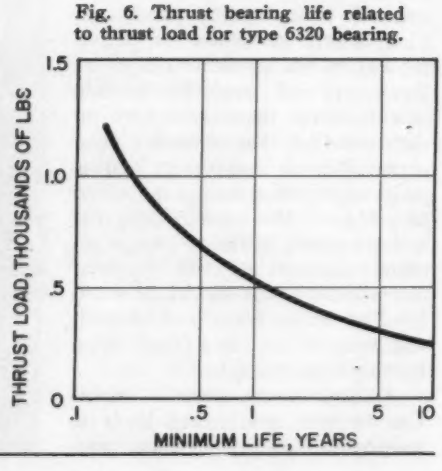


Fig. 6. Thrust bearing life related to thrust load for type 6320 bearing.

ard box location is on the left side of the motor viewed from the drive end. The conduit opening is normally in the bottom. If necessary, the box can be located on either side, either end or on top of the motor. If there is any doubt as to the suitability of the manufacturers standard location, make it clear where the box should be. Standard conduit boxes are customarily rotatable in 90 degree steps for bringing the conduit in from any one of four directions. Special oversize boxes may not be readily rotatable.

When accessories are ordered which require electrical connections, additional conduit boxes are provided for these. It is often inconvenient to bring wiring from all accessories into a single box.

ACCESSORIES

By accessories we mean the special purpose devices supplied with the motor for facilitating remote control of the drive or for motor protection. There is almost no limit to the number of different devices which may be furnished.

Space heaters are recommended for weather-protected motors or for any other motor which is subject to extreme conditions of humidity. This is especially true when the motor runs infrequently and is idle for long periods of time. The proper type and number of heaters to be used is best left up to the motor manufacturer. However, the buyer should specify the supply voltage he will furnish for the heaters. This is often overlooked.

There are many types and sizes of winding temperature detectors. The basic types are thermocouples, thermistors and thermostats. Either of the first two may be furnished as embedded detectors located in the stator slots between the coils. The third type, being bulkier, is mounted on the end turns of the windings and is therefore not as responsive to hot-spot coil temperatures.

Besides making clear which type of detector is desired, specify the relay contact arrangement wanted for the thermostat type. These may be had with contacts which either close or open on temperature.

Bearing temperature detectors are seldom used on motors below 200 hp. Included are the same three basic detector types as used for winding protection. Again the type of device and the contact arrangement must be specified.

It is possible to order the thermostatic type of device as a relay only, as a relay plus a direct reading dial thermometer or as a thermometer only. The latter is seldom used except in a well-attended location where the instrument may be frequently observed and the motor shut down manually in case of abnormally high bearing temperatures.

WRITTEN SPECIFICATIONS

Standard motor specifications have been written in most large organizations which buy or use quantities of electrical apparatus. As projects such as major plant expansions are worked up, these specifications are revised or new ones issued. They may range in size from a single page to a full volume.

When a firm is used to dealing continuously with a single motor supplier, he will probably have all their latest specifications on file. But sooner or later it may be necessary or expedient to buy from another supplier. Don't assume that he also has these specifications. He probably has never seen them. The safe thing to do in order to avoid confusion is to mention the specification in the order by name, number and date of issue and send a copy along with the order. Don't let the specification get out of date. As plant conditions or industry standards change, make revisions.

Don't take anything for granted. Unless all the requirements of the job are completely covered by published and clearly understood standards, spell those requirements out in the order. Work closely with the motor manufacturer's sales representative whose business it is to get your requirements across to the motor designer. Given the full story of what is needed they can make sure that what is supplied will do a good job at a reasonable price. **End**

"About these new electric trucks you ordered for us . . ."

WHAT SIZE AIR COMPRESSOR?

A systematic study of equipment requirements is an important factor in arriving at a decision

By JOHN E. MOODY, Joy Manufacturing Company, Pittsburgh, Pa.

THERE IS NO magic "cfm per square foot of plant area" formula to use. First, it will be necessary to obtain a complete list of all air-using equipment. This will include pneumatic tools, machines which use air, paint spray booths, etc. The list should be set up by departments and itemized by type and quantity.

The next step is to determine how much air each tool or machine will use. For some of the more common tools an approximate amount of air required can be found in Tables I through III. For other machines or tools it may be calculated or obtained from the manufacturers.

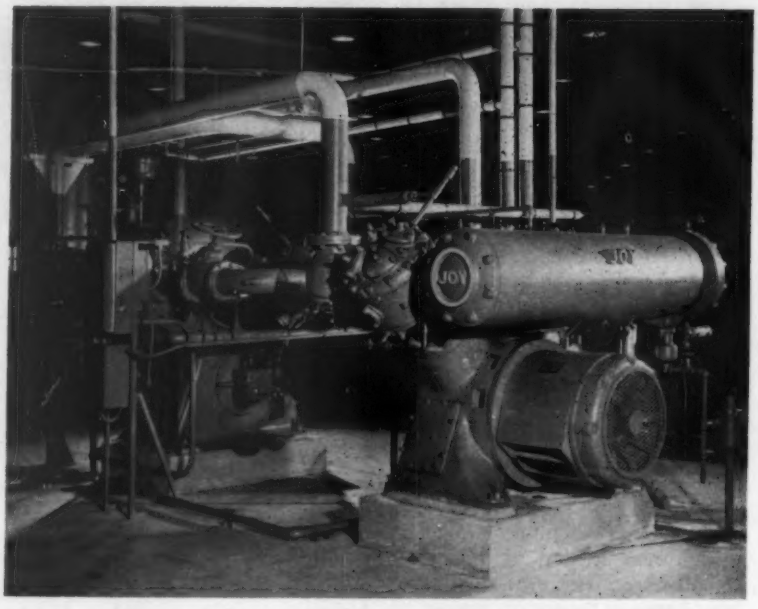


Fig. 1. An example of an air compressor installation in modern industrial plant.

Load Factor

Very few pieces of machinery using air will be operated 100 per cent of the time. This is especially true with small pneumatic tools operated by hand. It would be foolish to assume that 50 screwdrivers, each using 20 cfm, required a total of 1000 cfm for that department.

A factor then must be found which represents the percentage of time these tools are actually using air. As an example, consider the metal drills and screwdrivers shown in the Small Parts Assembly. See Table V. Here the screwdrivers and drills are used by the same man. He drills a series of holes, puts down the drill and picks up the screwdriver. The load factor, to start with, is 50 per cent.

However, as it is necessary to put the screws in by hand before they are driven, the factor is cut down to, say 30 per cent. In drilling the hole or driving a screw, this operation takes only a few seconds and the air is shut off until the next one is started; now the factor is 15 per cent. Last, the fact that no man works steady for eight hours must be taken into consideration. Time is consumed in rest periods, smokes, talking, etc., so in the end a factor of 10 per cent is arrived at.

The above example holds true, to a greater or lesser degree, with all pneumatic tools and must be found for all types of air-using equipment. This is the most important part of the total calculation. One could miss the amount of air used for a piece of equipment by 10 to 20 per cent without causing too much of an error, but because the load factor may vary from 5 to 100 per cent a careful study should be made in conjunction with the production personnel.

When the total amount of air has been calculated (in this case 1630 cfm), consideration must be given to loss of air through leaks, waste, and future expansion. In a new plant with a good, tight air system, 10 per cent should be added for loss and at least 25 per cent for errors in calculations, or machinery

Comments in this article are from a paper the author presented at the National Conference of Industrial Hydraulics in Chicago last October.

overlooked. This will also take care of some expansion and compensate for worn nozzles in the sand blast room. The total amount of air required would then be 2241 cfm which represents approximately 400 hp. This could be purchased as: one 400-hp unit; two 200-hp units, or three 150-hp compressors. The latter would give a greater safety factor. In arriving at a decision as to whether one, two or three units should be purchased, several questions should be considered, as follows:

1. If one unit is purchased, what would happen to plant production if the compressor were shut down?
2. Will the plant operate 8, 16, or 24 hr a day? Will it operate 5, 6, or 7 days a week?
3. What is the availability of spare parts and service?
4. If two or three units are purchased, how much of the plant can work on 50 or 66 per cent of the air capacity?
5. How long will it take to get the plant into full operation?
6. What is the comparative cost of one 400-hp, two 200-hp, or three 150-hp compressors with accessories?

It will be assumed that these can be answered as:

1. The entire plant would be shut down and most of the men would have to remain idle or sent home.
2. The plant will only operate eight hours a day and five days a week, but there may be a small second shift working later on.
3. Local branch offices have some spare parts on hand and service men are in the area.
4. With a 50 per cent load some of the plant operations could be juggled and very few, if any, of the men sent home. With 66 per cent load the plant could carry on as is. Both of these, however, are for a short period of time—approximately 24 hr.
5. It is assumed that the plant will not be in full operation for at least one year after it is opened.
6. The initial cost of compressors goes up with the number of units.

Taking all of these into consideration it is recommended that two 200-hp compressors, with accessories, be purchased but that room be left for a third, and possibly a fourth one later on.

(Turn page)

Table I. Approximate figures for air usage by variety of industrial equipment.

Type of Tool	Size or Capacity	Weight (lb)	Cfm
Drills or Reamers Rotary Type	1/4 in. Chuck	5	23
	5/16- 3/8 in.	6 1/4	25
	1/2- 5/8 "	8	30
	3/8-1 1/2 "	13	40
	5/8-1 1/2 "	13	50
	3/4-1 1/2 "	20	60
	1 -1 1/2 "	25	65
Grinders	1 1/2 in. Wheel		12
	2 " "		16
	4 " "		28 to 35
	6 " "		40 to 45
	8 " "		50 to 60
Hammers-Chipping	Light		15 to 25
	Heavy		25 to 30
Hammers-Riveting	1/4 in. Diam Rivet	4	10
	5/16 " " "	6	15
	3/8 " " "	10	20
	5/8 " " "	16	25
	3/4 " " "	18	30
	1 1/8 " " "	22	35
	1 1/4 " " "	24	35
	1 3/8 " " "	26	40
	1 1/2 " " "	28	40
Hoist—Tugger Type	500 Lb Lift		0.84 Ft Lift
	1000 " "		1.68 " "
	2000 " "		2.50 " "
	4000 " "		4.70 " "
	6000 " "		5.00 " "
Motors—Piston Type	1/2 Hp		10 to 10
	1 "		20 to 25
	2 "		40 to 50
	4 "		60 to 70
	5 "		90 to 100
	8 "		140
	15 "		240
Nut Runner or Screwdriver	No. 4	1	8
	" 6	1 1/4	8
	" 8	1 1/2	10
	" 10	2	10
	" 12	2 1/2	10
	1/4 in.	3	15
	5/16 "	4	15
	3/8 "	5	15
	7/16 "	6	20
	1/2 "	8	25
	5/8 "	10	35
	3/4 "	15	40
	1 "	15	45
	1 1/4 "	17	50
Wrench—Impact	5/8 in. Bolt	8-12	15 to 20
	3/4 " "	15-20	30 to 40
	1 1/4 " "	25-30	60 to 70
	1 1/2 " "	35-40	70 to 80
	1 3/4 " "	60-65	80 to 90
Paint—Spraying	Touchup		2 to 5
	Production		8 to 15
	Heavy Material Spraying		14 to 30

Table II-IV. Approximate air consumption of widely known devices and nozzles.

II. CHUCKS

Style of Cylinder	Bore of Cyl. (in.)	Stroke of Piston (in.)	Consumption cfm of Free Air Per Operation 80 psig	Power (lb) at 80 psig
Single-Acting	6½	1¼	0.1352	2184
Single-Acting	8	1¼	0.2300	3639
Double-Acting	3	1⅛	0.0315	565
Double-Acting	4	1⅛	0.0558	1005
Double-Acting	5½	1¼	0.0753	1904
Double-Acting	6½	1¼	0.1352	2564
Double-Acting	8	1¼	0.2300	3952
Double-Acting	10	1¼	0.3460	6120
Double-Acting	12	1¼	0.5022	9048

III. AIR CYLINDERS

Diam of Cylinder	Area of Cylinder sq in.	Cfm per Stroke at 100 psig — Length of Stroke 1 in.	2 in.	3 in.	4 in.	5 in.	6 in.
1 in.	0.7854	0.0035	0.0070	0.0105	0.0140	0.0175	0.0210
1½ "	1.7671	0.0079	0.0158	0.0237	0.0316	0.0395	0.0474
2 "	3.1416	0.0416	0.0292	0.0438	0.0584	0.0730	0.0876
2½ "	4.908	0.0221	0.0442	0.0663	0.0884	0.1105	0.1326
3 "	7.0686	0.0318	0.0636	0.0954	0.1272	0.1590	0.1908
3½ "	9.621	0.0433	0.0866	0.1299	0.1732	0.2165	0.2598
4 "	12.56	0.0566	0.1132	0.1698	0.2264	0.2830	0.3396
4½ "	15.904	0.0717	0.1434	0.2151	0.2868	0.3585	0.4302
5 "	19.635	0.0885	0.177	0.2655	0.3540	0.4425	0.5310
5½ "	23.758	0.1071	0.2142	0.3213	0.4284	0.5355	0.6426
6 "	28.274	0.1275	0.255	0.3825	0.5100	0.6375	0.7650

For Double-Acting Cylinders Multiply Above Figures by 1.97

AIR-USING EQUIPMENT FOR NEW PLANT

Types of Equipment	Quan.	Small Parts Assembly — Cfm each	Total	Load	Actual Cfm Factor
Metal Drills 5/16 in.	20	25	500	10	50
Metal Drills ½ in.	12	30	360	10	36
Metal Drills ⅝ in.	10	50	500	10	50
Screwdrivers ⅝ in.	15	15	225	10	23
Screwdrivers ½ in.	20	20	400	10	40
Screwdrivers ⅝ in.	7	35	245	10	25
Spot Welders W/4 ea 3 by 5 in. Cylinders da 15 opm	10	18.7	187	30	56
Clamping Devices, Air Cylinders					
4 by 6 in. at 10 spm da	32	6.7	214	30	64
5 by 5 in. at 10 spm da	10	8.7	87	30	26
6 by 6 in. at 12 spm da	10	18	180	30	54
Paint Spray Booths, 3 Guns Each, Production Work 10 cfm ea Gun	2	30	60	50	30
					454 Cfm

While it is cheaper to buy one large aftercooler to handle both compressors, they too will need maintenance; practice shows that separate aftercoolers are safer. In installing these, a bypass should be used so the air compressor will not have to be shut down when the cooler is worked on.

These units fall under the pressure vessel code and must be built to ASME or Massachusetts Standard Code. One receiver can be used for both compressors. It will be advisable to add a second unit when the third compressor is purchased.

If the air filters are to be mounted close to working personnel or other buildings, it is recommended that a filter silencer be used. This will cut down the noise level about 50 per cent. The type of filters wanted should be included in the inquiry.

Safety Devices

Most compressors of this size come equipped with low oil pressure switches which will shut down the unit in case of low oil pressure. These should be specified. It is also recommended that some type of protection be furnished against water failure. This can be accomplished by installing a thermo relay switch in the discharge air system. If the water is cut off, this air temperature will rise approximately 100 F in a very short time and the compressor will be shut down before any damage can be done.

Receivers are equipped with safety valves but if a bypass is used around the aftercoolers or if any hand valve is installed between the compressor and receiver, a safety valve must be placed between the compressor discharge and hand valve. All safety devices, except the valves, can be wired to lights or warning horns.

Soil tests should be taken to obtain advanced information for the foundation. The compressors should be arranged to save space but they must be far enough apart to allow proper maintenance. Consideration should be given to the pulling of intercooler tube nests, piston rods and motors. Room should be left for future compressors. The air filter should be mounted outside and

(Continued on page 208)

Above: Loaded pallets weighing 2000 lb are easily pushed or pulled on roller rails. Open side of racks permit easy access to pallets by lift truck. Right: Five-tiered rack is served by special crane which permits stacking to within two feet of ceiling. Operator controls crane movements from riding position. Crane, equipped with safety interlock system, prevents column from running into rack.

RACKS DOUBLE STORAGE SPACE

No Plant Addition Necessary—Saved: $650,000

MORE IN-PROCESS goods and finished materials are "up in the air" at Anchor Industries, Inc., these days, and the resulting increase in storage capacity and efficiency adds up to a cool $650,000 saving.

By installing a new system of quick-erecting Fas-Lok storage racks in an existing warehouse area and in the finishing department, the company more than doubled its storage capacity and saved the cost of building and equipping a 65,000-sq ft addition to its plant. Pallet storage capacity was increased 250 per cent—from 1400 to more than 3500 pallets—and the new system is providing faster, easier stock handling and better inventory control with a 10 per cent reduction in warehouse personnel.

The racks manufactured by Chicago Tramrail Corporation, Chicago, were double-decked in the warehouse area and erected in multiple-tiered heights in the finishing department. Fork lift trucks spot the 2000 lb capacity pallets carrying finished products—automobile floor mats—on the floor or set them on roller rails on the top tier where they are easily pushed back or pulled forward on the rollers.

The multi-tiered racks in the finishing department are served by the Trak-Rak Crane, which handles palletized loads of in-process goods, shipping cartons, and miscellaneous materials in and out of storage.

Before installation of the racks and the crane, this area could accommodate only 250 pallets on the floor. Now, Anchor is storing more than 1000 pallets in an area 200 ft long and 40 ft wide. Though the underside of the roof in this area is only 23 ft from the floor, the top of the highest pallet load is 21 ft from the floor—enabling Anchor to achieve almost complete utilization of the full height of the building for storage space.

The crane consists of a traveling bridge (which spans the entire storage area) and an overhead trolley from which is suspended an electrically operated rotating column equipped with a special fork lift. All operations of the fork lift, which revolves to either side of the aisle, moves forward or away from the racks, and raises or lowers on the column, are controlled by the operator who rides with the carriage.

As the crane deposits the pallet on the floor at the end of the aisle, a fork truck picks it up and delivers it to the required location in the plant. Because the crane operator's position is immediately adjacent to and travels with the fork carriage, pallet selection is quick and accurate, and pick-up and delivery to the aisle end are accomplished in a matter of seconds.

Installation of the self-standing racks was made without interrupting other work in the building. The racks, which consist of pre-assembled one-piece welded end sections, notched vertical members, and horizontal runners with attached wedge plates that slip into the notches, enabled Anchor to install the racks in record time and at a low cost. **End**

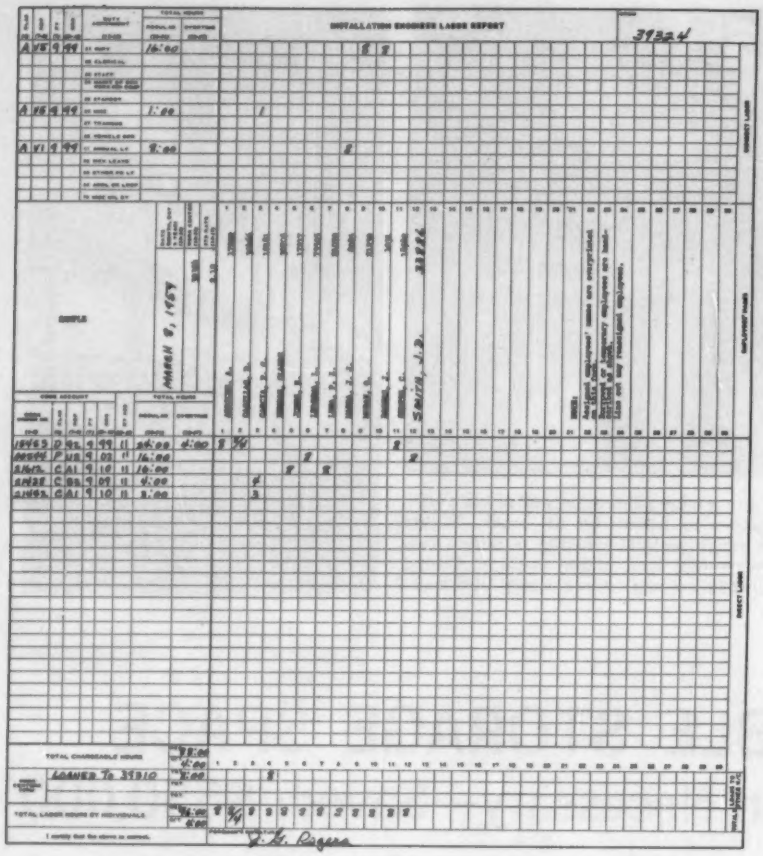


Fig. 1. Daily report, filed by Work Center foreman, details labor distribution.

The first article on Kelly AFB described the Civil Engineer Management System...in this article, we will see how the system is applied to the shops, and how it relates to the planning and scheduling of shop activities

HOW KELLY AIR FORCE BASE GETS . . . .
MORE MAINTENANCE PER DOLLAR

Part II. Applying Management System to the Shops

WORK PERFORMED by the several shops in the Civil Engineering Division is categorized by type and scope of the job involved. In no instance is work performed without a work authorization document; examples of these work orders, AF Forms 327, 1447 and 1451 are shown in Fig. 2. Each is designed for a particular type of maintenance work, and is classified as follows:

Individual Work Orders: An individual work order authorizes the accomplishment of a specific job or task. Individual work orders (AF Form 1447) are prepared for:

1. Normal day-to-day maintenance and repair jobs other than planned recurring maintenance.
2. Work beyond the capability of the preventive maintenance crews. More will be said about these crews later.
3. Work involving the installation, removal, replacement or transfer from one facility to another of non-expendable items of installed property.
4. Work, regardless of cost, which results in an increase or decrease of fixed plant unit quantities as recorded on the real property accountable records.
5. Work performed and services furnished by an outside contractor.
6. Any work for which individual job costs are required or desired.

Routine Work Orders: The planned, recurring maintenance accomplished by Civil Engineer work centers (preventive maintenance, relamping, street sweeping, grass mowing, etc.) is authorized by routine work orders, which are prepared on AF Form 327 and remain open for the entire fiscal year.

Complaint Work Orders: Maintenance or repair jobs which require 16 standard hours or less and can be accomplished with material

from bench stock are authorized on AF Form 1451.

A large portion of the Civil Engineering Division workload is requested by other base organizations on a Work Order Request. On receipt of this request, several determinations must be made: does it violate health, safety and fire protection practices; does it violate good engineering practice; is it included, wholly or in part, in previous requests; is it justifiable work. A priority is then applied in accordance with its importance.

When these actions have been taken, the request is forwarded to the Planning Section. The Planner breaks the job down into the smallest increments practicable for each craft or shop that will be involved in the job. He then prepares the required plans or sketches and outlines the sequence of events that must be followed. With the use of the published labor standards originally developed by Work Measurement technicians, the planner determines the amount of labor required to complete the work. Material requirements are determined and listed by AF stock list number to insure the use of planned materials.

An individual work order, AF Form 1447, and the material listing, AF Form 1445, are then prepared in the required number of copies. Estimated costs required for accomplishment of the requested work are entered on the Work Order Request form and forwarded together with all planning data to the Civil Engineer for approval. On approval, the material lists are delivered to the material expediters for procurement and accumulation of materials. The work orders and other planning data are delivered to the scheduler pending accumulation of the material. On receipt of material, the work is scheduled into the shops, consistent with their workload.

As the work progresses and is completed, the individual shops "claim" the standard man-hours authorized on their particular work order. The scheduler accumulates the standard or "earned" man-hours for each shop or work center each two weeks and forwards this "production count" information to Cost Accounting to be used in the preparation of the Earned Hour Report.

Another type of work and its authorization document is the routine recurring maintenance authorized by the Routine Work Order. These work orders are written for each shop or work center and remain open for the entire fiscal year, for such tasks as relamping, street sweeping, grass cutting, airfield maintenance, etc. Production count is accumulated by the scheduler who multiplies units of work produced by the applicable pre-determined labor standard for that work. Preventive Maintenance work is phased on a recurring time cycle basis and production count is taken as the prescheduled increments of the time cycle are completed.

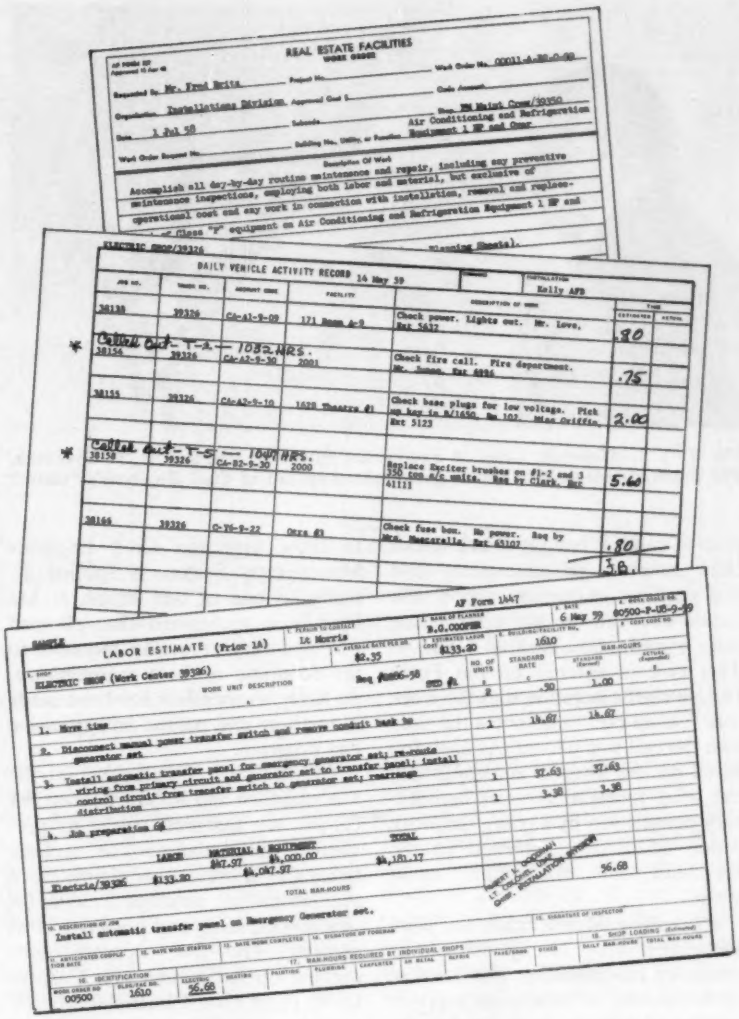

REAL ESTATE FACILITIES
WORK ORDER
Mr. Fred Reita
Installations Division
1 Jul 58
Air Conditioning and Refrigeration Equipment 1 HP and Over
Description Of Work
Accomplish all day-by-day routine maintenance and repair, including any preventive maintenance inspections, employing both labor and material, but exclusive of operational cost and any work in connection with installation, removal and replacement of Class "F" equipment on Air Conditioning and Refrigeration Equipment 1 HP and
ELECTRIC SHOP/39326
DAILY VEHICLE ACTIVITY RECORD 14 May 59
Kelly AFB
Check power. Lights out. Mr. Love, Ext 5612
Called out- T-S — 1082 HRS.
Check fire call. Fire department. Mr. Jones, Ext 4896
Check base plugs for low voltage. Pick up key in B/1650. Rm 107. Miss Griffin. Ext 5123
Called out- T-S — 1091 HRS.
Replace Exciter brushes on #1-2 and 3 350 ton a/c units. Req by Clerk. Ext 41111
Check fuse box. No power. Req by Mrs. Mascarella. Ext 45107
LABOR ESTIMATE (Prior 1A)
ELECTRIC SHOP (Work Center 39326)
Req #1886-58
Mr. Fred Reita
Install automatic transfer panel on Emergency Generator set.
Electric/39326
$133.80
$87.97
$4,000.00
$4,087.97
$4,181.17
96.68

Fig. 2. Three work orders used at Kelly AFB. Descriptions appear in text.

Small jobs which are usually received by telephone from other base organizations are classified as "complaint" work. These jobs usually require less than 16 man-hours for accomplishment and generally do not require detailed planning. As the call is received, the Work Order clerk enters the requested work on an AF Form 1451 for accomplishment by the appropriate shop. "Standards" are then applied to each line entry on the form. Thus, as many as seven separate jobs may be authorized on the same form for the same work center. The form is delivered to the scheduler for immediate scheduling to the shop.

The Work Order clerk is provided with a desk top radio transmitter-receiver and can communicate directly with any of the radio-equipped service vehicles which are available for emergency as well as

Fig. 3. J. L. Houston, Chief of Production Planning, left, and P. T. Overbeck, PM Superintendent. Map shows geographical spread of Civil Engineer's "plant."

routine calls. When the Work Order clerk receives an emergency call that requires immediate action, she radios the call to the appropriate vehicle crew. See Figures 4 and 5. This task is entered on the Form 1451 with the notation that the work was "called out," and notes the time that the call was placed. As each job listed on the form is accomplished, the shop foreman certifies satisfactory completion by signing the work order. It is then returned to the scheduler for production count credit.

Preventive Maintenance has been mentioned very briefly as routine recurring maintenance, but because of its essentiality to mission support, we should perhaps dwell on the subject further. Too, we would like to show how the Civil Engineer Management System is applied directly to one of our shops. It has long been recognized that planned PM is a very necessary requisite to the economy of base maintenance. At Kelly, every effort has been made to institute and pursue an aggressive PM program.

Of the 502 employees in the Maintenance and Repair Branch, 91 people are assigned solely to preventive maintenance. The section, headed by a preventive maintenance superintendent, employs 2 clerks for scheduling, filing and posting to PM records. The five separate units making up the section are: Carpenter & Paint unit; Electric & Miscellaneous unit; Plumbing unit; Heating unit and Refrigeration unit.

Each of the units maintains a separate set of loose leaf binder books containing the PM Control Cards, AF Forms 1355; PM Service Records, AF Forms 1354; and PM Check Lists, AF Forms 1353. These forms are shown in Fig. 6.

In addition to the bound records, the PM section maintains records on all equipment, systems, pavements, etc., for which the repair shops and plant operators have responsibility for performing PM.

Because of the size of the area to be covered, the base is divided into 6 zones with personnel from each unit assigned to each zone. PM personnel do not work out of a single area, but rather report directly to work in their assigned zone. Dispersed at strategic locations in each zone, 41 Preventive Maintenance trailers serve as "headquarters" for the PM crews. Being mobile, they can be moved as necessary to be located near the work in progress. These trailers serve several purposes. They are first, a base of operations for crews; they are a storage point for common materials in immediate demand and are storage for tools and equipment not in current use. As trailers are moved, their locations are plotted on a large base layout map in the PM Section office so that they may be located immediately in an emergency.

All work performed by PM crews is on a pre-determined time cycle schedule. These schedules vary according to craft and according to the necessity for servicing and main-

Fig. 4. Dispatcher radios trouble calls to mobile repair units.

Fig. 5. Radio-equipped truck, equipped for various repairs.

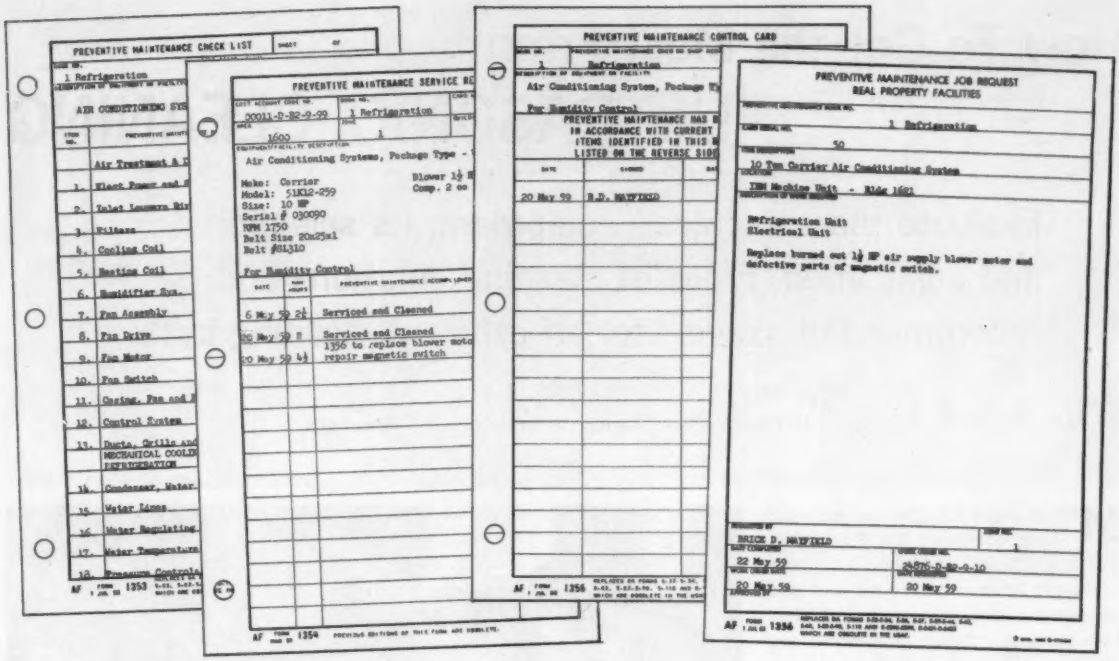


Fig. 6. These forms control preventive maintenance. PM crews use AF 1356, right, to request work beyond their scope.

tenance. For example, air compressors, elevators, pneumatic tube message systems, etc., require inspection, lubrication and servicing weekly, whereas most buildings and miscellaneous structures require PM only each 90 days. The frequency of preventive maintenance of real and installed property is based on the maintenance attention required by its design, construction and use.

There is a device in use at Kelly whereby each building occupant is called upon to participate in the PM program. A "Jot It Down" placard is placed in a conspicuous location within each building. These placards are designed to attract and encourage the participation of all personnel on the Base in the PM program. As discrepancies are noted by the building occupants, the needed repairs are "jotted down" on the forms attached to the placard. When the PM crew enters the building the noted discrepancies are corrected first, then the crew proceeds with the regular time-cycled PM.

In many instances, PM crews will find work that is beyond their capability because of the scope of repairs required. When work is encountered of such scope and timely completion of the time cycle cannot be accomplished, the crew leader will prepare a Preventive Maintenance Job Request, AF Form 1356, Fig. 4, and forward it to the Work Order Function for authorization and subsequent accomplishment by the repair shops. On completion of the request work, the job request is returned to the PM Section for historical data posting to the Preventive Maintenance Service Record.

Application of Standard Times

Each piece of equipment, facility, building or structure on which PM is performed has been time studied by work measurement technicians to determine the average time or standard hours required for necessary accomplishment of PM. Time cycles and frequency of inspections within each shop unit of PM have been analyzed and planned sheets have been developed for each of the units. The planning sheets list the end item tasks required and reflect the time standard allowed for each task.

As the crews or individual workmen progress through their assigned time cycle and complete the various items of inspection, the quantities of items are entered on the planning sheet. Each planning sheet is maintained two weeks, or one earned hour reporting period. At the end of the reporting period, the PM planning sheets are turned in to the scheduler. The scheduler will multiply the number of end items completed by the applicable standard to determine the number of earned hours creditable to the Preventive Maintenance Work Center.

The Civil Engineer Management System at Kelly has provided a means of both financial and manpower resources management never before available to the Civil Engineer. By using the cost information and the earned hour data furnished by this management system, the actual monies and manpower required to provide any given service or task can be easily determined, and appropriate planning carried out.

In the event of fluctuations in the money area, or if increases or decreases in workload are encountered, managerial prerogatives can be exercised to control any situation with the over-all effect being predetermined. The ability to determine realistic requirements and capabilities, coupled with the trait of flexibility is a desirable feature and a prerequisite for effective management. **End**

How To Get the Most From ULTRASONIC CLEANING

Evaluate these factors—equipment, its selection and application, types of cleaning solutions and recommended usage—for an efficient cleaning system

By PAUL W. STEEN, The Narda Ultrasonics Corporation, Westbury, L. I., New York

MANY DIFFERENT brands and types of ultrasonic generators and transducers and transducerized tanks are offered on the market and are coming into wide use in industry. However, it appears that there are as many different ideas about how to apply ultrasonic activity to cleaning problems and metal finishing applications, as there are people making or using the equipment.

A basic understanding of ultrasonics and how it can be applied to cleaning problems in industry is presented here to guide you in the selection and application of this equipment for your plant needs.

Ultrasonics simply bring a new form of agitation to cleaning operations. Working at great speed and force, sound waves create a swirling sea of sub-microscopic bubbles constantly forming and collapsing, that beat against the surface of the part being processed. This invisible bombardment rips the soils off the surface, catalyzes the desired reaction, and degasses the solution—all contributing to improved processing.

Two things are essential for any efficient cleaning operation: solution and method. The solution is the solvent—acid, alkaline, or detergent —which removes the soil. The method is the way in which the solution is applied, as, for instance, scrubbing by hand, spray machine washing, soaking, mechanical agitation, air agitation, or ultrasonic cleaning.

Utrasonic cleaning accomplishes its purpose in two ways. The one—cavitation of the liquid—is physical. The other is chemical—the solution dissolving the soluble soils, the detergent wetting out and dispersing the insoluble soils through the liquid.

Fig. 1. Fan blades are being cleaned in this unit. The blades, strung on wire, are completely degreased at the rate of 100 every two minutes. Shelf in the background shows a variety of cleaners and solvents which are commonly used.

Equipment used for ultrasonic metal finishing consists of three major components; generator, transducer, and tank, together with connecting cables and, in some cases, solution lines, filters, and rinse tanks, settling tanks and heat exchangers.

The generator may be one of two types—electronic or motor-driven. The electronic generator is relatively trouble-free, requiring only occasional replacement of tubes, and having few moving parts such as bearings that might wear out. Generators vary with different ultrasonic cleaning units and purposes: power, for instance, ranging from 110 to 650 volts; frequency from 18 kc to one megacycle; output from 20 to 10,000 watts. Dimensions and weight will also vary in accordance with output.

Transducers convert the high frequency electrical energy delivered by the generator into high frequency sound waves.

Transducers, too, may be of different types: either magnetostrictive, or piezoelectric. Magnetostrictive transducers, made of nickel and its alloys, may be used with solutions upwards of 212 F in tempera-

Figs. 2, 3, and 4. There are a number of ways in which parts can be placed in the cleaning solution. In Fig. 2, left, a wire basket is used for small parts. In Fig. 3, center, electronic relays are cleaned in a beaker of trichlorethylene solvent, immersed for 30 seconds. In Fig. 4, right, electric meter is placed in the tank by hand. Before, the meters had to be taken apart, cleaned by hand and then reassembled. Ultrasonic cleaning has eliminated all of these extra steps.

ture. The piezoelectric transducers, today generally made of barium titanate, are more limited in their temperature range. Immersible transducers may be mounted on the interior sides or bottom of the tank; others are attached to the bottom, outside the tank, the energy flowing through the walls of the solution container. Magnetostrictive transducers are always placed outside the tank.

Sound waves differ from the disturbances set up by other forms of agitation. Instead of spreading radially throughout the solution, they flow perpendicular to the face of the transducer. Transducers on the bottom of the tank create cavitation in a vertical path, those on the side in a horizontal path. It is essential that the parts, or the particular area of the parts to be cleaned, be directly in the path of the cavitation. Where only certain areas of large pieces need ultrasonic cleaning, the radiation can be focused on these areas alone. To assure thorough cleaning of large parts, it may be advisable to convey them through tanks past a series of transducers.

Frequencies recommended for cleaning range from 18 kc to about one megacycle. Generally, lower frequencies in the ultrasonic range are more effective, but those below 20 kc produce such a squeal that the cleaning equipment must be enclosed to prevent human discomfort. Because vibrations have greater amplitude at lower frequencies, a larger number of vapor bubbles formed will burst, and, it is this collapse which produces the agitation.

There are pros and cons regarding the choice of frequencies in various cleaning operations. In plain language, by using the lower frequencies you get more energy with less wattage while the higher frequencies require more wattage to obtain the same energy charge through the liquid. There is a very sharp decline in the effective transducer area that can be driven by one kilowatt of power at frequencies above 100 kc.

High Frequencies Clean Deep

However, the higher frequencies are more desirable where deep, blind recesses must be cleaned. Clogged hypodermic needles, for example, are cleaned better and more quickly with the higher frequency units. This is mainly because the higher the frequencies, the straighter and narrower the wave, so that all of the energy travels along a thin, straight path. This, though is offset by the loss in area which will be cleaned.

Tanks generally designed for ultrasonic cleaning are of Type 302 or Type 316 stainless and are often fitted with a drain, piping, and pump to carry solution through a filtering tank and heat exchanger, which brings it up to operating temperature before it returns to the cleaning tank. In small installations heating may be achieved by immersion steam coils.

Sometimes parts and volume are so small that cleaning tanks are merely one-gallon containers. These are easily filled and emptied by hand, particularly where transducers are mounted in a separate unit, or are portable and easily removed from the solution. It is not always necessary to purchase tanks for ultrasonic cleaning; those available may be adapted to the purpose. It is also possible to purchase spray washing equipment fitted with an ultrasonic cleaning stage.

Vibrations will penetrate most solids. For example, should a tank of liquid be subjected to these vibrations and another, smaller container of liquid be immersed in the first, the vibrations penetrate the smaller container and cavitate (or energize) the liquid in it, as well as in the larger one, without appreciable loss of energy. Thus in a unit with but one container, it is possible to immerse many sub-containers filled with different solutions in successive cleaning actions.

Some metal finishers are accustomed to placing their parts in a basket. Ultrasonic vibrations seem to penetrate solid sheet metal much

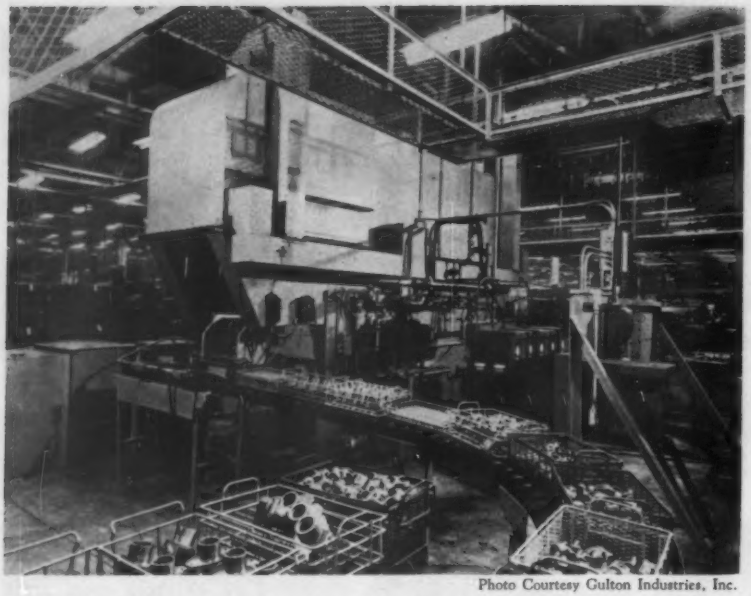


Photo Courtesy Gulton Industries, Inc.

Fig. 5. Degreasing and cleaning of machine parts in an automobile plant, are accomplished by this automated ultrasonic cleaning system. Metal parts are collected in steel baskets, placed on the conveyor and moved through the cleaning area.

better than they do perforated plastic or metal wire mesh or woven material. Units using a million vibrations a second permit greater penetration of their energy through the wire mesh than the lower vibration units, due to the shorter wave lengths at higher frequencies, but some loss is noted nevertheless.

There is a dampening effect on ultrasonic cleaning vibrations focused through screens of various weaves. A wire screen of one half-inch openings or larger is quite efficient and has little effect upon cavitation. An 8-mesh (one eighth-inch opening) shows a loss of efficiency. Greater loss of cavitation can be expected from a 20-mesh or window screen, while a tightly woven mesh shows the greatest loss.

Special Containers

It is possible to design special containers made either of aluminum, polyethylene, glass, stainless steel or a combination of these. Where the transducers are placed at the bottom of the tank and focused upwards, as most are, the basket may have a flat or coned stainless steel bottom and meshed sides so that the removed contamination may gravitate outward and down through the mesh sides.

In either case (flat or coned), a few perforations on the bottom enable entrapped air beneath the bottom to escape, eliminating an acoustic barrier. In this manner the parts will still receive the full charge of the cavitation effect.

Racking of parts may have considerable bearing on the efficiency of ultrasonic cleaning. It has been found, for instance, that cylindrical parts should be so arranged that their longitudinal axis is parallel to the radiation waves. Considerable study remains to be done on this phase of the cleaning operation.

Solutions used for ultrasonic cleaning should be capable of cavitation, with a density about the same as, or higher than, water; they should have relatively low vapor pressures at working temperatures; and they should have low viscosity. They should also be economical and free-rinsing.

Previous experience has shown, above all, they should have the two most important properties of cleaners for any other operation; they must efficiently remove the soil involved; and they must be safe on the surface being cleaned.

As in any other cleaning method, compounded detergents, skillfully blended to remove certain soils from certain metals, do the most thorough cleaning in the shortest time, with maximum economy and safety.

There are three basic types of such detergents: alkaline, acidic and solvent, although some materials may combine solvents with acids for special purpose applications.

Alkaline detergents are caustics, phosphates, silicates, carbonates; surface-active agents, which speed the wetting-out, penetrating, and emulsifying action of the solution; lime-sequestering materials such as polyphosphates, to control the salts which complicate cleaning in hard water; buffering agents to maintain the pH of the solution; and colloidal agents to keep the soils suspended and prevent their redeposition on the surfaces being cleaned.

Alkaline detergents recommended for ultrasonic use range in pH from an almost neutral 7.5 to better than 13. Most such materials are in powder form, used in concentrations ranging from one to two ounces per gallon of water to one to two pounds per gallon, depending upon the nature and extent of the soil. A liquid detergent, which is coming into frequent use, is used at three to four per cent by volume of water. Temperatures of the alkaline solutions range from 130 to 160 F.

How To Use Milder Solutions

The milder of low pH alkaline materials are recommended for use on metal, glass and plastic to remove buffing and polishing compounds. Others, with a slightly higher pH range are recommended for the removal of tougher soils, such as tripoli, rouge, buffing compound, palm and vegetable oils and fats, from aluminum, brass and zinc. Such materials are inhibited against attack on these metals, neither etching the aluminum and zinc, nor tarnishing the brass.

Still stronger alkaline materials are recommended for the removal of buffing and lapping compounds and more difficult soils from iron and steel. And finally, the materials with a pH range of 13 are used to remove paints and primers, although considerable work remains to be done before the problem of dead paint loading up the solution will be solved.

Some of the strongly alkaline detergents containing chelating agents remove even rust, scale, and other

Table lists characteristics of cleaning solvents to help you select the proper ones to fit specific cleaning jobs in your plant.

Name of Solvent	Boiling Point F	Specific Gravity	Flash Point F	Vapor Pressures (in MM of mercury) 80 F	120 F	160 F	Maximum Allowable Concentration (PPM)
Water	212	1.00	none	26	88	244	.....
Chlorinated Hydrocarbons							
Perchlorethylene	250	1.62	none	21	57	160	200
Trichlorethylene	188-189	1.46	none	85	210	450	200
Trichlorethane	237	1.32	none	140	350	670	500
Carbon Tetrachloride	169	1.58	none	120	290	630	25
Chloroform	142	1.50	none	210	500	.....	100
Methylene Chloride	104	1.33	none	440	.....	.....	100
Petroleum Distillate Fractions							
Mineral Spirits	350-400	0.76-0.77	126-130	.....	.....	.....	500
Stoddard Solvent	310-395	0.78-0.80	100-104	50	210	650	500
VMP Naphtha	230-290	0.73-0.75	48-52	185	660	.....	500
Aromatic ("Coal Tar") Solvents							
High Flash Naphtha	270-320	0.86-0.89	78	.....	.....	.....	200
Xylol	250-310	0.86-0.87	63	5	27	70	200
Toluol	228-234	0.86	42-50	31	90	200	200
Benzol	175-180	0.88	12	105	280	530	35
Alcohols, Esters, Ketones							
Cyclohexanone	315-320	0.95	129	.....	17	43	100
Ketone	242-243	0.80	74	.....	18	68	500
Acetate	190-192	0.88	60	68	175	390	500
Isopropanol (99%)	178-179	0.79	72	50	165	475	200
(91%)	175-177	0.82	80	.....	.....	.....	400
Ketone	175-176	0.83	25-35	120	270	560	250
Ethanol (99-100%)	172-173	0.79	60-70	65	215	550	1000
Denatured	171-174	0.82-0.83	57	.....	.....	.....	.....
Ethyl Acetate	160-178	0.88-0.89	77-80	100	280	590	400
Methanol	148-150	0.79	60	135	400	.....	200
Acetone	133	0.80	15	230	550	.....	500

oxides from ferrous surfaces, at the same time as they remove dried and baked-on soils. Even tough oil and heat-treat scale bow to high frequency sound waves.

Alloy steel parts should be presoaked in solvent-acid detergent and then ultrasonically cleaned in an alkaline chelating solution.

There is an interesting relationship between the cleaning abilities of different concentrations of alkaline detergents. One heavy-duty alkaline detergent which cleans in one-half a minute at two ounces per gallon of water, takes more than one minute when the concentration is boosted to four ounces per gallon. The efficiency of two other detergents declined by almost half-a-minute when the concentration was raised from four to six ounces per gallon, but increased by same margin when concentration was raised.

Thus, the strength of solution is no valid index of cleaning efficiency. The cavitational ability of the liquid solution may be adversely affected by increasing the concentration.

Acids are recommended for the removal of oxides, tarnish, scale, rust and stains in ultrasonic treatments. The nature of the metal—iron, steel, brass, zinc, or aluminum and their alloys—will determine the selection and strength of the material. Temperatures range from room temperature upwards, depending upon the extent of the scale and oxides to be removed. Concentrations range from 5 to 25 per cent by volume for less active and 20 to 50 per cent for stronger solutions.

Where acids used are powdered materials, concentrations run from four to 16 oz per gallon of water.

Parts cleaned ultrasonically must be taken from the path of cavitation and lifted through the cleaning solution, in which the soil has been dispersed. Such soils may redeposit on clean surfaces. To prevent their adherence, proper rinsing is essential. Pressure spray, or even ultrasonic rinsing stages may be advisable.

What solvents should be used with the new ultrasonic cleaners? The solvents must be right physically and chemically because the liquid that couples the energy output of the transducer to the work also participates in the cleaning process (as in the case of aqueous cleaning solutions).

Presumably the solvents already used in the plant's washing operation meet the second requirement. They "do something to the dirt", without damaging the metal. But for the first requirement—to do a good cavitating job—the solutions

(Continued on page 208)

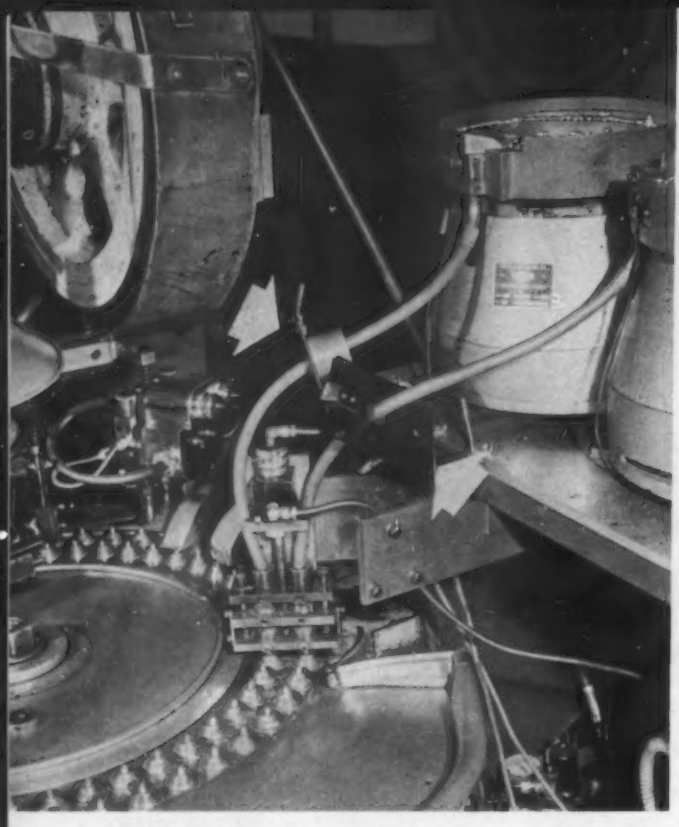
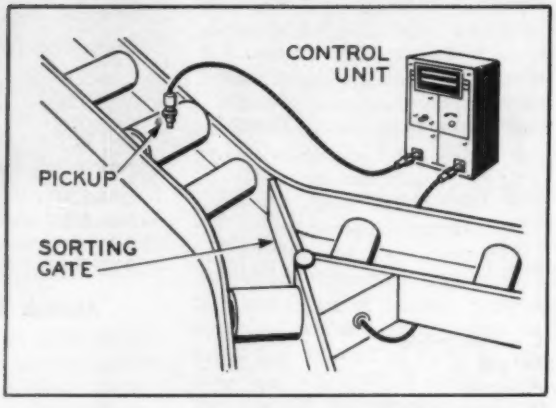
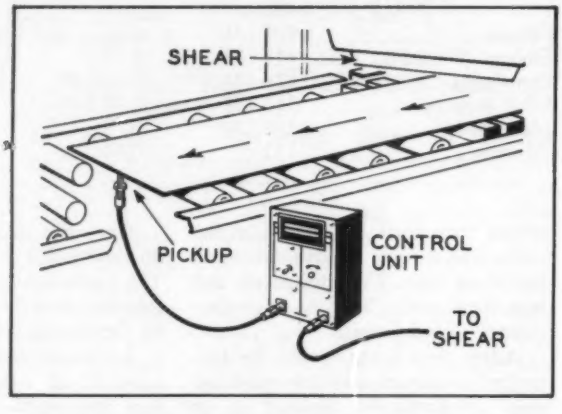


Fig. 1. Hollow coil proximity pickups, arrows, sense presence of fittings in tubes and turn feeders on and off.

Fig. 2. Top: High speed sorting of pistons is accomplished with proximity detectors. Larger size pistons operate gate.

Fig. 3. Bottom: Sheet metal is cut-to-length accurately with detector. Pickup senses leading edge of sheet and trips shear.





PROXIMITY DETECTOR SOLVES CONTROL PROBLEMS

DETECTION of moving or stationary ferrous or non-ferrous objects without physical contact, at distances ranging from several feet down to a few thousandths of an inch, is now possible using proximity detector systems. Applications in industry include counting, batching, accurate position control and control of machine tool and production line operations.

Each system consists of a proximity pickup, mounted at the point to be detected, a shielded connecting cable, and a control unit. The pickup or sensing element is a coil of wire sealed with epoxy resin in either a metal mounting shell or a phenolic mounting base. In shape it can be a flat plate, a probe, or a hollow coil through which parts to be sensed pass.

Depending upon physical requirements, the pickups can be mounted as far as 100 ft from the control unit. The pickup and the connecting cable form a resonant circuit of a modified Hartley oscillator. The rest of the oscillator circuit is housed in the control unit along with two or more stages of amplification. The control unit also contains an output tube biased beyond cutoff by a ger-

manium diode rectifier and a relay activated by the output tube.

Depending upon the operation being controlled, the relay can be wired for normally "on" or normally "off" operation. The relay has a positive "on-off" snap action and is not affected by nearby electrical or electronic equipment.

Metal parts moving past the pickup as rapidly as 60,000 per minute can be detected as well as stationary metal objects. The pickup does not attract or hold ferrous chips and is very sensitive to very thin metal pieces such as aluminum foil.

A frequent application of proximity systems is in the control of a vibratory bowl parts feeders, Fig. 1. The pickup, installed on the feed track, detects when the track is filled and shuts off the feeder. As soon as the track is no longer full, the parts feeder is started again.

These systems are also used to sort pistons by gaging their diameters, Fig. 2. A pickup is mounted over a chute through which pistons of various sizes pass. Pistons of larger diameters are in closer proximity to the pickup than smaller pistons and only the larger pistons are detected. The control unit provides a pulse that actuates a gate, closing off one branch of the chute and opening another through which the larger pistons pass.

Proximity detectors are also used for cutting sheet metal to accurate lengths, Fig. 3. As the leading edge of the sheet reaches the pickup, a signal causes the control unit to activate a relay, this, in turn, will automatically operate the shearing machine.

Through the use of a hollow coil pickup, mounted on a gravity feed chute, parts can be electronically counted as they drop through the chute, Fig. 4. As the part drops through the hollow coil, the pickup senses it and the control unit operates an electric counter.

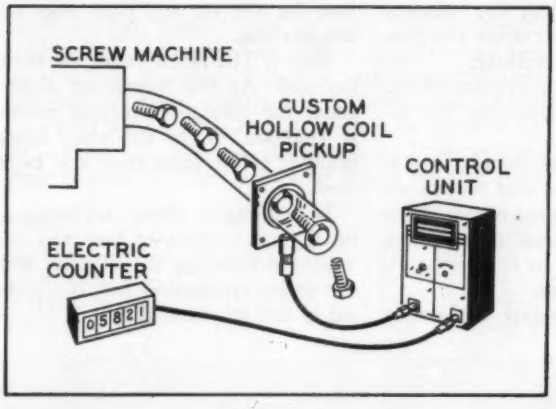
Two pickups are used to insure positive positioning of a crankshaft for a grinding operation, Fig. 5. The pickups are mounted under the crankshaft at either end. If the crankshaft is in the correct position for grinding, it is equally distant from both pickups and each pickup pulses its associated control unit. The control units operate a solenoid causing the grinding machine to lower and begin work.

If the crankshaft is incorrectly positioned, either one or both of the pickups will not be activated, and the grinding machine will not operate. Positioning accuracy repeatability of 0.001 to 0.002 in. can be achieved.

You probably do not work with movie film in your plant but here is another application, Fig. 6, that demonstrates the extreme sensitivity of the proximity pickup system. A small speck of aluminum foil tape, 0.1 in. in diameter, is placed on the edge of the film to act as a cueing signal while the film is being printed. This replaces the cueing notch previously used and eliminates problems associated with contact type mechanical switches. **End**

Additional Information

If you would like more information about this proximity detector, just write to the Editor, Plant Engineering, 308 E. James St., Barrington, Illinois, or indicate "Proximity Detector" on the post card in this issue.



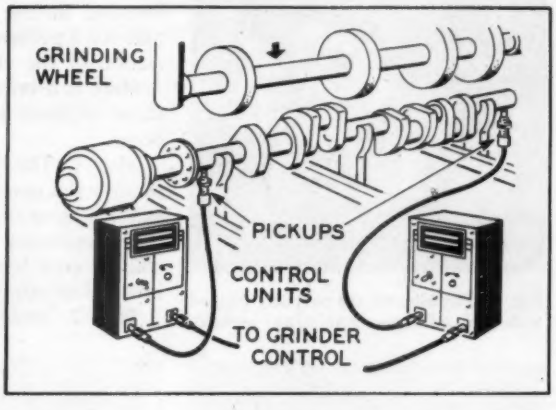


Fig. 4. Above: Parts can be counted at speeds up to 60,000 per minute using electronic counters and proximity pickup.

Fig. 5. Upper right: Two pickups are used with output contacts in series to insure accurate positioning of crankshaft.

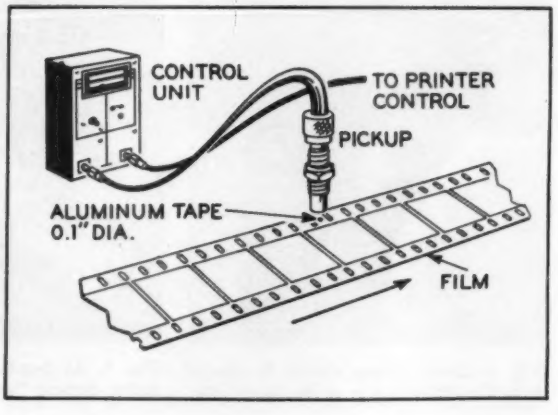


Fig. 6. At right: Demonstrating sensitivity of detectors, this film cueing setup uses spot of aluminum foil 0.1 in. diameter.

ONE WAY TO REPAIR PIPE ELL INSULATION

Fig. 1. Metal bands are prepared for clamping the elbow halves together.

Fig. 2. The elbows are partially packed with an asbestos insulating cement.

With these aluminum elbow halves insulation can be repaired in 1, 2, 3, 4 steps. Here's how . . .

THE "weakest links" in any plant's insulated piping system—and a never-ending maintenance expense—are the cracks that occur in the insulated material at the ell sections in a system.

These photos, taken at a large refinery, show how the cracked insulation at the ells was repaired by using Humped Elbows, made by the General Aluminum Supply Corporation. These elbow halves can be installed in less than five minutes time for a permanent cover and protection of the ell sections.

Here is a brief description of the steps required in applying the elbows:

Step 1. The first thing to do is remove the cracked and broken insulation from the pipe elbow. After this, prepare the metal bands. These will be used later to clamp the elbow halves together.

Step 2. Next, select the proper size elbow halves to provide a proper fit over the area being repaired. Then, prepare the two halves to serve as a "mold," by partially packing them with an asbestos insulating cement.

Step 3. The elbow halves are now applied to the area. They should fit snugly over the straight run of the insulated pipe and enough area should be allowed at the center of the elbow to compensate for the varying pipe sizes or connections.

Step 4. The metal bands are then fastened. As the bands are tightened, the insulating cement inside is "molded" to fit the pipe, insulating it at the same time it is covered.

No cutting or fitting, no mastics, no drying or clean-up time was involved in repairing the ell joint, and the entire application was completed in five minutes. **End**

Fig. 3. Elbow halves should fit snugly over the straight run of insulated pipe.

Fig. 4. As bands are tightened, insulating cement "molds" to fit the pipe.

Fig. 5. Job is finished in five minutes and no cutting or fitting was necessary.

time saver series
CONSTRUCTION COST ESTIMATING PART 6

ROOF DECKS AND ROOFING

ROOF DECKS

1. Wood fiber-cement slabs—Composed of chemically treated wood fibers coated with fire- and water-resisting portland cement and bonded together to form an incombustible slab. The interconnected fibers form air spaces that provide high insulating and sound absorbing qualities. Slabs can either be clipped to steel joists or used in connection with bulb tees.

Thickness, in.	2	3
Maximum span, ft	3	4
Weight, lb per sq ft	6	8
Material cost per sq ft	$0.299	$0.399
Installed cost per sq ft	**$0.40**	**$0.52**

If the slabs are installed using bulb tees, the maximum joist spacing is eight feet. Material is clipped to bulb tees, and then grouted over at the tees.

Installed cost of 2-in. slab and tee $0.55 per sq ft
Installed cost of 3-in. slab and tee $0.70 per sq ft

On pitched roofs, add 3 cents per square foot.

2. Wood fiber slabs—Made of wood fiber impregnated with inorganic binder. Two styles—plank or tile. Noncombustible, possesses insulating and acoustical qualities, can be sawed, lightweight, top surface is weather protected with roofing felt. The plank is either nailed or clipped on. The tile is clipped to bulb tees and then grouted in. Used on either flat or pitched roofs.

Plank

Thickness, in.	2	2½	3
Joist spacing, in.	36	42	48
Weight, lb per sq ft	4.25	5.25	6.25
Plank size, in.	30x72; 30x96	30x84	30x96
Material cost, sq ft	$0.30	$0.375	$0.45
Cost per sq ft, installed	**$0.37**	**$0.445**	**$0.52**

Tile

Material cost of tile is the same as plank. The installed cost varies according to the bulb tee installation. Tongue and groove both ends, sheets 24 in. by 48 in. and 32 in. by 48 in.

Thickness, in.	2	2
Joist spacing, ft	4 to 5	7 to 8
Weight, lb per sq ft	4.25	4.25
Cost per sq ft, installed	**$0.51**	**$0.54**

Using 2½-in. thickness, add $0.075 to 2-in. price.
Using 3-in. thickness, add $0.15 to 2-in. price.
An eight-man crew can put up 10,000 sq ft per day.

3. Precast Gypsum Plank—Metal edge gypsum plank is a precast structural roof deck unit, reinforced on all edges with 22 ga galvanized sheet steel formed into mating tongues and grooves. Planks are also integrally reinforced with an electrically-welded mat of 16 ga galvanized steel. Made only in one size, 2 in. thick, 15 in. wide and 10 ft long, each plank covers 12.5 sq ft; weight, 10.5 lb per sq ft. Maximum span, seven feet; maximum safe load capacity, 55 lb per sq ft. A five-man crew will lay 1200 sq ft per day.

Material cost	$0.34 per sq ft
Labor cost	0.10 per sq ft
Total cost	**$0.44 per sq ft**

On pitched roofs, labor cost will be increased $0.03 per sq ft. Material has a U factor of .51; with ½ in. of insulation, U is .30 and with 1 in. of insulation, .21.

4. Poured-in-place gypsum—This form of roof deck covering is poured in place with continuous reinforcing and securely welded sub-purlins. Permanent form boards, which remain as the undersurface of the completed deck, may be ½-in. gypsum form board, 1-in. wood insulation fiber board, ¼-in. asbestos cement board, 1-in. mineral fiber form board or 1-in. wood fiber insulation acoustical form board.

Table I. Poured-in-place gypsum

	Material lb per sq ft	Joist spacing 4'-5' Cost per sq ft	Joist spacing 7'-8' Cost per sq ft
2-in. gypsum concrete ½-in. gypsum form board	10.7	$.039	$0.43
2-in. gypsum concrete 1-in. wood fiber board	10.1	0.47	0.51
2¼-in. gypsum concrete ¼-in. asbestos board	12.2	0.47	0.51
2-in. gypsum concrete (economy)	10.0	0.47	0.51
(standard		0.49	0.53
(deluxe)		0.51	0.55
2-in. gypsum concrete 1-in. acoustical form board	9.9	0.55	0.59

5. Precast Cement Roofing Tile—Can be used for all types of industrial, commercial, institutional and public buildings on either flat or pitched roofs. Material, made with lightweight aggregate and portland cement, can be sawed and nailed. Safe load, 60 lb per sq ft.

Precast Channel Tile

Size, in.	2¾	3½
Width, in.	24	24
Length (max.)	6 ft 4 in.	8 ft 4 in.
Thickness, in.	Leg 2¾, web 1	Leg 3½, web 1
Weight	12 lb per sq ft	14 lb per sq ft

Tiles are laid directly on the supporting steel, joints

are grouted with asphalt. A six-man crew will lay between 960 and 1050 sq ft a day.

Cost of material	$0.428 per sq ft
Cost of labor	0.172 per sq ft
Installed cost, 2¾-in. or 3½-in. tile	**$0.60 per sq ft**

The 3½-in. tile is the same price as the other due to the fact that the 2¾-in. has more steel in it.

Precast Tongue and Groove Plank

Width, in.	16
Length (max.)	9 ft 0 in.
Purlin spacing	6 ft 0 in.
Thickness, in.	2
Weight, lb per sq ft	12
Cost installed	**$0.605 per sq ft**

The planks have tongue and groove sides and ends. Laid at random, with bearing on two or more supports.

Precast Flat Slabs—Perlite Aggregate

Thickness, in.	lb per sq ft	U Factor	Slab length
2⅝	10	.24	5 ft 4 in. Max.
3	12	.21	5 ft 4 in. to 6 ft 2 in.
4	16	.165	6 ft 2 in. to 8 ft 4 in.

The 2⅝-in. slab is most generally used and the installed cost per sq ft is the same as channel tile—$0.60.

6. Steel Roof Deck—There are three basic types of steel roof deck: closed rib, open rib, and long span. The most commonly used gages are 18, 20, and 22. There are various widths: 12 in., 18 in., and 24 in. Roof deck is engineered to fit the job, comes either galvanized or with a baked enamel finish. Accessories such as cant strips, tapered cant saddles, ridge and valley plates and sump recesses can be furnished.

Cost of steel roof deck per square, including 2-in. end lap

Gage	Closed rib		Open rib	Long span
	1½ in.	1¾ in.	1½ in.	
22	$27.50	$31.35	$29.15	
20	31.35	35.20	34.65	
18	37.40	40.70	40.70	$72.60
16				84.70

1. Closed rib type deck is folded back upon itself and comes in depths of 1½ in. or 1¾ in. Roof purlins or joists should not be spaced over 8 ft, 4 in. Maximum length of sheet 20 ft, 3 in.

2. Open rib type has a space between ribs that varies from ¾ in. to 2¼ in. depending upon the manufacturer. Rib depth 1½ in., maximum length of sheet 28 ft, 6 in. Maximum joist spacing 10 ft, 0 in. Open rib is more efficient structurally than the closed type, and has a wider edge and better distribution of metal.

3. Long span decking comes in lengths up to 28 ft, 6 in. Maximum spacing of joists 20 ft, 0 in. Designed for almost equal space between each side of the rib. Rib depth in some cases is 4½ in.

The cost of applying open or closed type rib decking is $0.05 per sq ft; long span, $0.065 per sq ft.

Note: The costs of the various types of roof deck can be kept up-to-date by applying the "Engineering News Record Building Cost Index." Costs presented here are based on an index of 525.

ROOFING

Built-up roofing consists of alternate plies of saturated felt and moppings of pitch or asphalt, covered with a top pouring of pitch or asphalt into which slag or gravel is imbedded.

Asphalt—melting point 190F, must be used between insulation and metal roof deck. Use 25 lb per mopping per 100 sq ft, between plies; 60 lb per 100 sq ft for pour coat.

Pitch—melting point 120F, 30 lb per mopping per 100 sq ft, between plies; 70 lb per 100 sq ft for pour coat.

Gravel—400 lb per 100 sq ft.

The roofing price is approximately the same whether applied over metal or wood deck, precast concrete or gypsum. Deduct area of an opening if its area is greater than 200 sq ft.

Type	Bond cost per square	Type of roof	Cost per sq ft
20-year	$1.50	4-ply, 15-lb felt	$0.16
15-year	1.25	3-ply, 15-lb felt	0.14

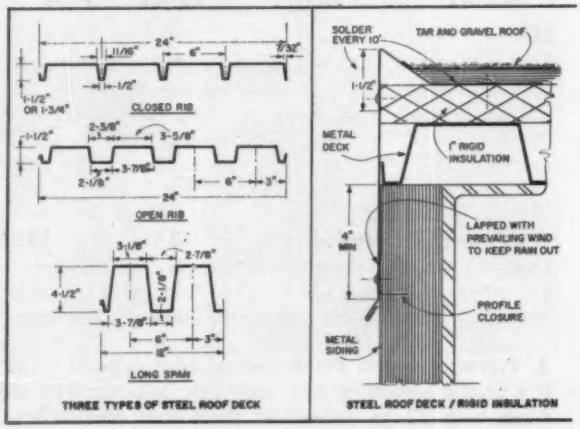
A vapor barrier is used if the inside of the building is exposed to high humidity; 2-ply vapor barrier cost $5.00 per 100 sq ft.

A special adhesive, Lexsuco, will give fireproof construction a Class A fire rating on metal deck roofs for $1.00 per square extra.

Insulation Board

Type	C factor	Cost per sq ft
1-in. fiber board	0.36	$0.14
1½-in. fiber board	0.24	0.22
2½-in. fiber board	0.19	0.28
¾-in. glass fiber board	0.36	0.14
1⅛-in. glass fiber board	0.24	0.185

Two layers of 1-in. fiber board will cost the same as one 2-in. layer, but the roof will have extra mopping and cross joints. The thicker insulation is also more difficult to handle. Impregnated board usually costs $0.75 per square more.



THREE TYPES OF STEEL ROOF DECK

STEEL ROOF DECK / RIGID INSULATION

Cant strip used at the edge of the roof at the parapet wall, size 4 in. by 4 in., costs $0.20 per lin ft.

Composition roof flashing is run up on the parapet wall 8-10 in., goes over the cant strip. Cost, $0.50 per lin ft.

Roofers hourly wage rate, $3.20; with $0.08 welfare, $0.07 vacation, plus insurance and taxes, it will be $3.95. Including overhead and profit, $5.00 per hour.

Weight of 4-ply built-up roofing per square:

4 plies, 15-lb felt	60 lb
4 moppings of pitch, 30 lb per mopping	120
60-lb pour coat	60
Gravel	400
Total weight per square	**640 lb**

Weight of 3-ply built-up roofing per square:

3 plies, 15-lb felt	45 lb
3 moppings of pitch, 30 lb per mopping	90
60-lb pour coat	60
Gravel	400
Total weight per square	**595 lb**

Weights of various types of insulation per square:

1/2-in. fiber board	70 lb
1-in. fiber board	140
1 1/2-in. fiber board	220
2-in. fiber board	320
3/4-in. glass fiber board	101
1 1/8-in. glass fiber board	138

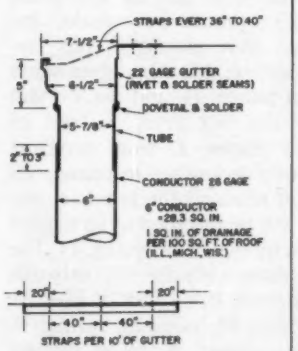
The insulation is fastened down with either 25 lb of pitch per square or 4 lb of Lexsuco.

Gravel Stop

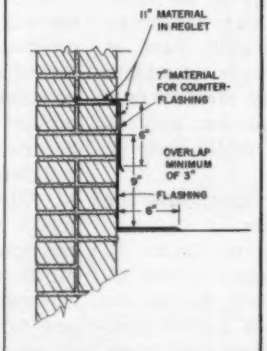
The purpose of a gravel stop is to provide an edge for the roofing paper to butt against, and thus prevent the wind from getting under the edge of the paper.

On industrial buildings, gravel stops should not be less than 22 ga galvanized steel, and should overlap the siding by at least four inches. Between the corrugations of the siding and the gravel stop, a filler strip should be used.

There is no per-pound price for a gravel stop—cost is dependent on the job. A 22 ga galvanized sheet steel gravel stop with a 15-in. girth will cost $0.98 per lineal foot, installed by a sheet metal contractor. A 12-in. girth will cost $0.92 per lineal foot.



TYPICAL GUTTER INSTALLATION



FLASHING / COUNTERFLASHING

GUTTERS

For a 6-in. gutter, 22 ga material will cost $2.50 per lineal foot installed. This includes tube, straps and end heads. Gutters should be riveted and soldered.

The conductor should be corrugated to allow for expansion due to ice. Maximum gage 26. Material costs $0.50 per foot plus $0.20 for installation or a total of $0.70 per foot. Elbows cost $2.50 each.

Capacity of conductors

3-in. 7.1 sq in. area	5-in. 19.6 sq in.
4-in. 12.6 sq in.	6-in. 28.3 sq in.

Translated to roof coverage, 1 sq in. of conductor area will handle 100 sq ft of roof.

FLASHING

Metal flashing is used in connection with a flat roof deck covered with built-up roofing and extends up on the parapet wall a minimum of nine inches and projects under the roofing six inches. A counter flashing is placed over and above the flashing, its upper edge inserted in a reglet receiver built into the wall.

Metal flashing—fastened to metal deck roof with sheet metal screws, or to gypsum or wood roofs with nails, joints soldered every 10 ft, extends under the roofing six inches and up on the side a minimum of nine inches. Labor, 5.5 hr per 100 ft (includes fabrication time).

Counter flashing—inserted in a four-inch hooked reglet receiver and counter flashing extends down a minimum of six inches, joints every 10 ft clipped together. Labor 4.5 hr per 100 ft (includes fabrication).

Labor rate—Tinner $3.59 per hr including vacation, welfare fund and pension; insurance and taxes $0.43. Total, including overhead and profit, $5.50 per hr.

On industrial buildings galvanized sheet metal (at least 22 ga) should be used for making the reglet, flashing, and counter flashing. The sheets come in 30-in. or 36-in. widths, 10 ft long and weigh 1.5 lb per sq ft. The reglet takes 11 in. of material, counter flashing 7 in.

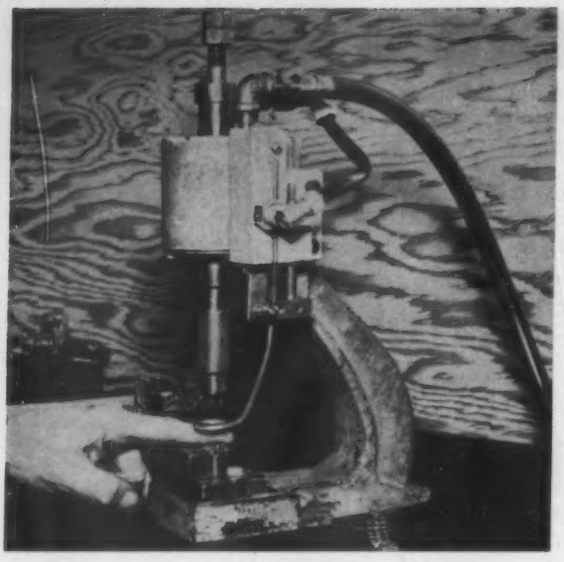
Cost of 22 ga galvanized flashing: 1.5 lb per sq ft, $0.16 per lb. One lin ft of reglet, flashing and counter flashing requires 33 in. of material or 2.75 sq ft.

2.75 sq ft x 1.5 = 4.125 lb at $0.16 per lb	$0.66
Screws and solder	.20
Labor (reglet and counter flashing) $\frac{4.5 \text{ hr} \times \$5.50}{100}$	.25
Labor (flashing) $\frac{5.5 \text{ hr} \times \$5.50}{100}$	.30
Cost of galvanized flashing, installed	**$1.41 per lin ft**

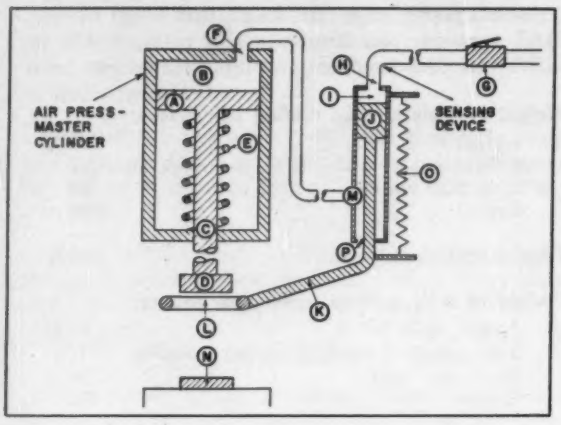
Cost of 16-oz copper flashing: 1 lb per sq ft; $1.00 per lb.

2.75 sq ft = 2.75 lb at $1.00 per lb =	$2.75
Solder and screws	.20
Labor (reglet and counter flashing)	.25
Labor (flashing)	.30
Cost of copper flashing, installed	**$3.50 per lin ft**

These costs are for flashing on metal deck, gypsum and wood roofs.



Left: Ring guard "senses" operator's finger and prevents the ram from coming down. Below: Schematic of pneumatic lines shows how safety device operates.



SAFETY RING GUARDS AGAINST ACCIDENTS

Air press operations are safer now because of this safety device

SAFEGUARDING kick presses, as well as pneumatic bench presses is, in many instances, a tough problem to solve. Such a problem, that of providing adequate safety measures to eliminate minor injuries to workers' fingers, faced the management of Watchbands, Inc., North Attleboro, Mass.

They use a large number of relatively inexpensive and easy-to-operate air presses, which replace conventional foot presses, to fabricate wrist watch bands.

Due to the very nature of the small end product—their manufacturing process consists of the assembly of many parts which have to be handled primarily by operators' fingers—production was often interrupted by finger injuries to the skilled as well as to the new employees. Injuries cropped up despite the fact that the ram's stroke was controlled by speed and pressure control valves.

The Loss Prevention Engineer of Liberty Mutual Insurance Company assigned to Watchbands, Inc., encountered the serious problem on a regular service call. It was referred to Liberty Mutual's Research Center of Hopkinton, Mass., for a suggested solution.

Upon evaluation of possible new methods of adequate safeguards, it became apparent to Dr. Willem S. Frederik, Director of Research at Hopkinton, and his staff, that the design, in principle, must consist of a "sensing" device.

The final product of this research was a ring guard that successfully overcame all of the problems. In operation, this guard is controlled by a sequence cylinder connected to the master cylinder of the air press. If the ring guard contacts or touches any part of the operator's hand or finger, the piston does not complete its stroke and the air pressure port to the master cylinder remains closed. The punch would then be inoperative.

Schematic above shows how the safety device operates:

Piston, A, sliding in cylinder, B, is connected by means of rod, C, with punch, D. Spring, E, will return piston, A, to its highest position after the air pressure is released. Air enters the top of cylinder, B, through port, F. Without the safety device, the foot-operated valve, G, admits air from the storage tank directly to inlet, F.

With the sensing device installed, the air is admitted through valve, G, enters at H, into an additional small-diameter cylinder, I. The piston, J, in cylinder, I, is directly connected by means of rod, K, with a "ring" guard, L, which fits snugly around punch, D. The air pressure will depress piston, J, allowing air to enter main cylinder, B, through the orifice, M, in cylinder, I.

It is obvious that air can enter the main cylinder only under the condition that piston, J, has bypassed orifice, M. Any obstruction between punch, D, and die, N, will prevent the ring guard, L, and its attached piston, J, from traveling sufficiently downward to open port, M. After releasing the pressure, piston, J, will be returned to its highest position by means of spring, O. The air in main cylinder, B, exhausts through port, P, by way of inlet, F, and orifice, M, allowing spring, E, to return piston, A, to its original position. **End**

PLASTIC PIPING
PLASTIC VALVES—

TO WHAT EXTENT ARE THEY USED
HOW ARE THEY BEING USED
WHAT DO USERS THINK OF THEM ?

A PLANT ENGINEERING READER SURVEY

TO WHAT EXTENT are plastic piping and valves being used in industry for the handling of corrosive materials? How are they being used? What do the users of these products think of them? Answers to these questions were the three major objectives of a study recently conducted by PLANT ENGINEERING and completed in July of this year.

As the intent of the survey was to obtain information on quite specific applications rather than undertake a broad-gage market study of plastic piping and plastic valves, the survey sample was restricted to PLANT ENGINEERING readers in the metalworking, and chemical and process industries where the incidence of a corrosive environment might be expected to be relatively high.

A total of 500 questionnaires was mailed. Of these, 375 (75 per cent) went to readers in the chemical and process industries, 175 (25 per cent) to those in the metalworking industries. The replies received totaled 160—a 32 per cent return—with 114 (71 per cent) representing chemical and process industry readers, 46 (29 per cent), readers in metalworking plants. A further breakdown of the replies by industry showing incidence of a corrosive problem and use of plastic piping or valves is given in Table I.

Table I. Analysis of replies by industry to show incidence of corrosion problems and extent of plastic piping systems.

	Respondents		Have Corrosion Problem		Use Plastic Piping or Plastic Valves	
	No.	Per cent	No.	Per cent	No.	Per cent
Chemical and Process Plants						
Chemicals (incl. plastics)	44	100	36	82	29	64
Oil and gas	17	100	15	88	6	35
Paper and pulp	23	100	21	91	19	83
Pharmaceuticals	10	100	10	100	9	90
Photographic	3	100	3		3	
Rubber	12	100	4	33	4	33
Tanning and leather	5	100	2		1	
Total	114	100	91	80	71	61
Metalworking Industries						
Aircraft	8	100	7	87	6	75
Automotive	2	100	1		1	
Electrical or electronic equipment	18	100	14	88	9	50
Fabricated metals	16	100	5	31	5	31
Marine (shipbuilding)	2	100	1		0	
Total	46	100	28	61	21	46
All respondents	160	100	119	74	92	57

1. Is the corrosion of piping and valves a problem in your plant?

Piping and valve corrosion present a problem in almost three-fourths of the plants surveyed. Answers from the 160 respondents were divided as follows:

Yes ..... 119 (74 per cent)
No ..... 41 (26 per cent)

Plastic Piping

2. Does your plant use plastic piping for corrosive environments?

Among the 160 plants represented in the sample, 91 (57 per cent) use plastic piping, 69 (43 per cent) do not.

	Use Plastic Piping—Have Corrosion Problem (Base 119 Respondents)	Use Plastic Piping—Have No Corrosion Problem (Base 41 Respondents)
Yes	**90 (76 per cent)**	**1[1] (2 per cent)**
No	**29 (24 per cent)**	**40 (98 per cent)**

[1]. Pharmaceutical handling requires a sterile environment.

Table II. Plastic piping applications and types of plastic employed to resist various kinds of corrosive conditions.

Applications	Types of Plastic Used
Well water, hydrochloric acid, bead airveying.	Polyethylene, vinylidene chloride, phenolic asbestos.
Oil pilot plant, research units.	Polyethylene, PVC.
Cold bleach handling, cold water.	PVC.
Chlorine, hypochlorite bleach, other paper and pulp chemicals.	Polyethylene, PVC.
Low temperature chemical lines (aniline).	Polyethylene, PVC.
Dilute hydrochloric and sulfuric acids, de-ionized water.	Polyethylene, PVC.
Hydrochloric acid.	PVC, vinylidene chloride-lined pipe and valves.
Tannic acid, pickle feed lines.	PVC.
Drain and transfer lines for nitric-sulfuric acid cleaning tanks.	Vinylidene chloride.
Varied chemicals (explosives).	Epoxy glass-reinforced, polyethylene, PVC, glass fiber-polyester.
Muriatic acid.	PVC, vinylidene chloride-lined pipe.
Hydrochloric acid, ethylene glycol.	PVC, ABS copolymer.
Hydrochloric acid, sulfur dioxide fume waste.	PVC.
Demineralized water.	PVC.
Corrosive fumes (photographic chemicals).	PVC, glass fiber-polyester.
Process, drain and service lines for photographic chemicals.	Polyethylene, PVC.
Plating and finishing chemicals.	Epoxy glass-reinforced, polyethylene, glass fiber-polyester.
Alum	Polyethylene, PVC.
Demineralized water, air and instrument connections, chlorination, hydrochloric acid.	PVC, polyethylene, chlorinated polyether, vinylidene chloride- lined pipe.
Acid drains, demineralized water.	PVC.
Rubber compounding chemicals.	PVC.
Paper chemical process lines.	Polyethylene.
Nitroglycerine, waste acid water, drinking water.	Polyethylene, PVC.
Chemical waste lines.	PVC.
Distilled water distribution.	PVC.
De-ionizing equipment, aluminum foil etching chemicals.	Polyethylene, PVC, glass fiber-polyester.
Chlorine and bleach liquor systems.	Epoxy glass-reinforced, polyethylene, PVC, glass fiber-polyester.
Demineralized water.	ABS copolymer.
Distilled water, zinc chloride, instrument tubing, chemical laboratory piping.	Epoxy glass-reinforced, polyethylene, PVC, glass fiber-polyester.
Hydrochloric acid, de-ionized water.	PVC.
Acid chemical milling, agitation and pickling tank lines.	PVC, vinylidene chloride-lined pipe.
Plating solutions.	PVC.
Pulp and paper processing.	PVC.
Low temperature inorganic acids.	Glass fiber-polyester.
Plating solutions.	Epoxy glass-reinforced, PVC.
Cold brine, acid lines.	PVC, polyethylene.
Emergency handling of organic material.	Polyethylene.
Corrosive chemical and product lines.	Polyethylene, PVC, glass fiber-polyester.
Corrosive chemicals.	Epoxy glass-reinforced, glass fiber-polyester, furan, phenolic resin.
Electroplating solutions.	Vinylidene chloride.
Ferric chloride storage and transfer.	PVC, polyethylene.
Sulfuric acid, calcium hypochlorite, chlorinated water.	Polyethylene, PVC, vinylidene chloride, ABS copolymer.
Various chemicals and dyestuffs.	Epoxy glass-reinforced, polyethylene, PVC.
Transfer lines for caustic glue.	Polyethylene.
Water, weak acids, underground lines.	Polyethylene, PVC, glass fiber-polyester.
Demineralizers.	Polyethylene.

3. If you use plastic piping, please describe the applications.

Inorganic acids, bleaches, demineralized and de-ionized water, corrosive fumes—low pressure and low temperature corrodents of all kinds—in process, transfer, storage and disposal lines are handled by plastic piping. The specific applications for which the 90 respondents (Par. 2) use plastic piping are shown in Table II.

4. What types of plastic piping do you use?

The following tabulation shows the frequency with which the 90 respondents (Par. 2) using plastic piping for the handling of corrosive materials use one or more of the various types of piping. The use of these materials for specific applications is shown in Table II.

Types of Plastic Piping Materials Used and Frequency of Use (Base 90 Respondents)

	Plants in Which Used	
	Number	Per Cent
Polyvinyl chloride	70	78
Polyethylene	28	31
Epoxy glass-reinforced	13	14
Vinylidene chloride	13	14
Glass fiber-polyester	12	13
Cellulose acetate butyrate	1	1
Other		
ABS copolymer	5	6
Phenolic resin	2	2
Furan	2	2
Phenolic asbestos	1	1
Fluorocarbon	1	1
Chlorinated polyether	1	1

5. If you do not use plastic piping, why not?

Nineteen of the 29 respondents (Par. 2) with a corrosion problem are not using plastic piping for one or more of the following reasons:

Pressure and temperature limitations of plastic piping	6
Durability of other materials (impact resistance)	4
Size and cost limitations of plastic piping	3
Other materials satisfactory	3
Plastic piping not fireproof	2
Less maintenance on other materials	1
Presence of organic solvents in processes	1
Failure of PVC and polyethylene on acid fume service	1

6. What improvements in the characteristics of plastic piping would increase its use in your plant?

Both users and nonusers of plastic piping suggested improvements in its characteristics which would increase use within their plants. These suggested improvements are shown in Table III. Under the heading "Durability and strength" are included such replies as: "higher shock strength," "resistance to vibration," "tougher," "less subject to mechanical damage," "stronger for threading," "greater rigidity requiring fewer supports," and "decreased brittleness."

Greatest drawback to increased use of plastic piping is the temperature limitation. A number of respondents indicated process temperatures in excess of 200 F which, at least on the basis of their present knowledge of available materials, makes the use of plastic piping impossible or impractical. Greater durability, especially for exposed piping, would also substantially increase use. Based upon the present small sample, cost does not appear to be as important a deterrent to increased use of plastic piping among present users as it is to initiating its use among nonusers.

Table III. Improvements which increase plastic pipe use.

	Users (Base 63 respondents)		Nonusers (Base 14 respondents)	
	No.	Per cent	No.	Per cent
Higher temperature tolerances	45	71	5	37
Greater durability	26	41	5	37
Higher pressure tolerances	5	8	2	14
Lower coefficient of expansion	3	5		
Greater chemical resistance	3	5	1	
Lower cost	3	5	4	29
Improve cast 90 degree fittings	1			
Elimination of chloride contamination	1			
Easy disconnect for re-use	1			
Improved welding cement	1			
Easier field fabrication	1			
Standardized specifications	1			
More educational information (fabrication and assembly)	1			
Increase in available sizes	1		2	14
Decreased maintenance			1	
Increased fire resistance			3	21

Plastic Valves

7. Does your plant use plastic valves for corrosive environments?

Among the 160 plants represented in the sample, 71 (44 per cent) use plastic valves or plastic inserts, 89 (66 per cent) do not. No respondents use plastic valves who do not use plastic piping although several reported using plastic inserts for valves of conventional materials where plastic piping is not used.

8. If you use plastic valves, please describe the applications.

Since the uses for plastic valves correlated closely with the uses for piping, it seemed more informative to make a separation in the answers to this question between users and nonusers of plastic piping. Twelve reasons for *not* using plastic valves were given by respondents who do use plastic piping. These reasons were:

Slow to adopt until materials proven and prices lowered.
Stainless steel does not break, plastic valves twist off.
Have not been sold on durability and strength for general service.
Not strong enough for our applications.
Temperature range insufficient.
Experience on plastic piping and valves has not been good.
Cost too high.
Just haven't tried them.
Use stainless steel.
Considered them not sufficiently developed.

No immediate application for valves.
Prefer stainless.

Following reasons were among those given by respondents who use neither plastic piping nor valves although a corrosive environment is present:

We have extremely high temperature problems.
Economically not feasible for limited application.
Temperature limitations.
Have only rust from hot water, brass solves problem.
Use stainless steel.
Pyrex glass and stainless steel have proved more satisfactory for our operations.
Pressure and temperature limitations.
Pressure and temperature limitations for use on lines having heavy petroleum contaminant.

9. How does the performance of your plastic valves compare with that of metal valves?

Fifty-one of 71 plastic valve users compared, in the accompanying tabulation, the performance of plastic valves with those made from conventional materials and plastic valves were considered "better than" or "equal to" by 90 per cent of these respondents.

Performance of Plastic Valves Versus Valves of Conventional Materials (Base 51 Respondents)

Better than	**26 (51 per cent)**
Equal to	**20 (39 per cent)**
Poorer than	**5 (10 per cent)**

An additional respondent stated that plastic valves were "better than" on temperatures below 150 F and "poorer than" above that temperature.

10. Do you specify the plastic valves used in your plant? If not, who does?

Of the 62 users indicating responsibility for specifying plastic valves, 39 (63 per cent) replied affirmatively, 23 (37 per cent) negatively. However, in only one case[2] where someone other than the respondent himself had the responsibility was it indicated clearly that he had neither a shared responsibility nor an indirect responsibility through a subordinate or through his department.

Responsibility for Specifying Plastic Valves (Base 62 Respondents)

Respondent only	**39 (63 per cent)**
Respondent's department	**6 (10 per cent)**
Respondent's subordinate	**4 (6 per cent)**
Shared with subordinate	**4 (6 per cent)**
[2]Other departments only	**1 (2 per cent)**
Shared with other department	**1 (2 per cent)**
Not indicated	**7 (11 per cent)**

11. What size of all-plastic valves do you use?

Although most of the 51 respondents supplying this information gave a considerable range of sizes, only the maximum size used is shown below:

½ in.	**1**
¾ in.	**5**
1 in.	**10**
1½ in.	**5**
2 in.	**19**
3 in.	**8**
4 in.	**3**
Plastic inserts only	**2**

Table IV. Various industrial applications for plastic valves.

Acids	**Liquid alum**	**Liquid alum**
Acid treatment piping	**Plating solutions**	**Distilled water**
Chlorine	**Bleach liquor, alum**	**Acid process lines**
Bleach making	**Alum**	**Acids and bleach**
On acid lines	**Strong acids, small sizes**	**Demineralized water**

Ferric chloride piping system	Fluorocarbon trim on a still
Fluorocarbon valve liners	Corrosive chemical handling lines
Low temperature inorganic acid lines	Processing tanks, demineralized water
Water control flow to de-ionizer	Acid treatment plant piping
Shut-off on caustic and acid etch tanks	Acid circulating systems
Plating and finishing area connections	On de-ionizer and process piping
On all chemical process piping	On muriatic acid handling system
Shut-off on acid and pickle feeds	Hydrochloric acid service

Low pressure and temperature lines handling solution hypochlorite, mild acids
Fluorocarbon sleeves to protect metal cocks
Sulfuric and hydrochloric acid handling lines
On lines handling aluminum sulfate solution
On piping handling demineralized water, corrosive fluids and effluents
On lines handling hydrochloric acid and de-ionized water
Flow control, metering, stop valves, ball check on chlorine and bleach liquor systems
Subsurface installations for acid waste water
Lines handling zinc chloride, chlorine, sulfuric acid below 160 F
In chlorinations and hydrochloric acid handling
Photographic chemical process lines at low temperatures and pressures
Discharge valves from tanks handling paper chemicals
Cold water and cold dilute sulfuric acid lines
On lines handling dilute sulfuric acid, chlorine, treated water, and dilute acid-iron-salt solutions
Shut-off valves, diaphragm type, nitric and sulfuric acid cleaning tanks, drain and transfer lines
Shut-off on dilute hydrochloric and sulfuric acid lines, de-ionized water
On piping handling chlorine, hypochlorite bleach and other chemicals
Waste acid handling and acid chemical milling
Diaphragm valves on hydrochloric acid line

12. What sizes of metal valves with plastic inserts do you use?

Again because of the range of sizes used, only the maximum size plastic insert used by the 43 respondents supplying this information is listed below:

2 in.	**8**
2½ in.	**1**
3 in.	**10**
4 in.	**3**
6 in.	**6**
16 in.	**1**
All plastic valves only	**14**

13. Please name the manufacturers of the plastic valves used in your plant.

Given the small sample used in this study, a tabulation of the manufacturer(s) whose plastic valves are now in use would not represent an approximation of the relative strength of companies in this field. The 38 respondents supplying this information named 28 manufacturers, one or more of whom supply plastic valves to their plants. Of these, Chemtrol Corp. (Valve Div.), Grinnell Co. (Grinnell-Saunders), Hills-McCanna Co., Lunkenheimer Co., Tube Turns Plastics, Inc., were

named as being used in five or more plants. The other companies named whose plastic valves are used in at least two of respondents' plants were: Cooper Alloy Corp. (Vanton Pump & Equipment Corp. Div.), Dow Chemical Co., Duriron Co., Inc., Jamesburg Corp., Joseph T. Ryerson & Son, Inc., Saran Lined Pipe Co., and United States Rubber Co.

14. What plant corrosion problems do you have that might eventually be solved with plastic valves?

Replies to this question were received from 61 respondents. Of these, 14 indicated that no corrosion problems were present and none looked for in the future and 15 stated that no additional uses for plastic valves were anticipated. Following is a listing of replies from the 32 respondents who indicated their plant corrosion problems could be solved through use of plastic valves.

For cooling water lines, caustic lines (50 deg Baumé at 120 F).

Environmental lab salt spray, caustic dip tank.

Condensate lines, acid lines.

All phases of piping in paper mill except high heat—fresh water, white water, stock lines, chemical systems.

Same as those solved with plastic pipe—water lines, weak acid lines, underground lines (chemical manufacturer).

A potential problem in our acid passivating equipment where piping installation has been made recently.

Many, depending on processes and particularly temperatures at which valves may be used. Most of our chemical processes involve temperatures up to or exceeding 500 F.

Acid service.

Sodium and calcium hypochlorite.

Molten salts at 325 degrees, ferric metallic corrosion-resistant baths which must be contained and transferred.

Rust, acid corrosion.

High temperature, low pH acid-base process corrosion. Now use 316 stainless or 20 stainless. Would hope someday plastics could cut down cost of these applications.

Acid handling, bleach handling, gas handling.

We might use plastic valves on 4 and 6 in. lines if plastic could be used on 400 to 600 psi lines and cost less than stainless steel.

Product and process pipeline valves.

Valves on paper making stock lines—now using stainless.

Many corrosion problems common to paper industry—acid, alkali, salt, water, etc.

Many, if valves suitable for 200 F and 150 psi were available.

Paper stock with pH of 4.5.

Handling chlorine and anhydrous hydrochloric acid.

Acid cleaning operations.

Tan lines at 212 F or higher.

We find it necessary to use stainless steel in all stock lines due to acid condition. If and when price becomes comparable and plastic pipe can handle temperature ranges up to 200 F, we would extend its utilization to 85 per cent of all our piping.

Sulfuric acid sludge.

Numerous (chemical manufacturer).

On pipe lines located outdoors.

pH of 4.4 is now causing some corrosion on bronze-mounted valves. If plastic industry comes up with something better at comparable cost that will take hard usage, we might be interested.

For lines handling sulfuric, nitric and mixed acids.

For lines handling pigment slurries, diazo solutions and other materials in pigment manufacture.

Electroplating solutions.

Plating department piping systems.

If plastic valves become cheap enough and heat resistant enough, they could be used universally on all utility services (plastic film manufacturer).

Results and Summary

Corrodents of all kinds in process, transfer, storage and disposal lines present problems in about 75 per cent of the plants surveyed, all in the chemical and process or metalworking industries. In slightly over half of these plants, plastic piping is used to solve some or all of these problems. The pressure and temperature limitations of plastic piping are the greatest drawbacks both to extension of its use in plants already using some plastic piping and to introducing its use into those with a corrosion problem but using other, sometimes more costly, materials.

Plastic valves are not used as extensively as plastic piping. In addition to pressure and temperature limitations, respondents indicate that a need for greater durability makes use of other valve materials mandatory. Where plastic valves are in use, 51 per cent find their performance superior to and 39 per cent at least equal to valves of conventional materials.

In 85 per cent of the plants supplying the information, the respondent himself is responsible either directly or indirectly, through his department or through a subordinate, for specifying the plastic valves used.

The all-plastic valves used range in size up to 4 in. and plastic inserts for metal valves up to 16 in., the most-used sizes being 1 in. and 2 in. valves and 3 in. inserts.

Within the small sample involved in this study, no manufacturer established a clearly dominant position among the 28 named as supplying plastic valves to respondents' plants. Five manufacturers supply plastic valves to five or more of the 38 plants covered (the maximum being 7), seven manufacturers to at least two plants, and sixteen to a single plant.

The problems which might eventually be solved through use of plastic valves are tied closely to extended use of plastic piping and that, in turn, to the improvements in the characteristics of plastic materials suggested by respondents. While presently available plastic materials are finding increasing use in piping systems for the handling of corrodents, PLANT ENGINEERING readers suggest that use can be extended as rapidly as more resistant plastics become available—more resistant, in some cases, to increased temperatures and, in others, to increased working pressures, chemical attack or physical damage. Cost appears to be a slightly stronger deterrent to introducing plastic piping systems into some plants than to extending such use in plants with some plastic piping installations. **End**

Fig. 1. Custom-built console in front of guard contains nine two-way intercommunication units. Subsystem panels on the right can provide guard with security information on specific areas.

"ONE GUARD" SECURITY NERVE CENTER

A GUARD can remain at one location while he supervises building security. Pushbutton switches are used to open and close gates to provide authorized entrance, and to start and stop security equipment (electronic noise detection system, for example). Lights serve as visual alarms for fire, intrusion or special equipment failure. A complete Minneapolis-Honeywell Electronic Security System includes a centralized guard console and a number of subsystem panels which can be supervised continuously by one person.

One of the panels, for instance, might contain indicating lights to show the guard the area in which a fire situation exists; another the zone where the intruder is present and still another to help him keep tab on such things as boilers, production vats, and other equipment.

Signals for the entire system are sent over a single pair of wires or leased telephone line. Audio and visual alarms notify the console operator instantly whenever the lines are compromised. If the power fails or is turned off by an intruder, provisions can be made to automatically switch system operation to batteries or a standby generator.

Since there is no single device that meets every possible security requirement, a variety of detection devices is offered for mounting in areas to be supervised and connected to the centralized guard console.

Fire Detection

Fire detection can be accomplished through use of fixed temperature-rate of rise detector heads; while smoke can be detected by smoke-sensing devices. The console can also be tied in with the fire sprinkler system or alarm pull boxes.

Speakers mounted remotely from the panel can pick up above-normal noise in a particular area and automatically set off an audio and visual alarm on the console.

The Vitronic Eye may be used to detect motion in indoor and outdoor lighted areas. Whenever the light pattern between the transmitter and amplifier is disturbed, an alarm signal is energized.

In another approach an audible signal is sent to the closed area and a receiver located in the room is tuned to the resulting wave pattern. Any motion in the area disturbs the signal pickup by the receiver and triggers an identifying buzzer and alarm light on the central panel.

Through use of a new capacitance-type circuit, it is possible to detect the presence of a person who approaches within three feet of the security fence. A unique two-wire system detects the presence of a possible intruder, and sounds an alarm without the person actually touching the fence. A built-in compensator prevents false alarms from contact made by birds, paper, rain, snow, sleet and wind.

Sections of the fence can be graphically diagramed on a central station subsystem panel. Indicating lights, can tell the guard at a glance the particular area in which possible intrusion is occurring.

Television screen mounted on the console and a number of pushbuttons (depending on how many gates are to be controlled) can provide the guard with both visual observation and automatic control over entry. **End**

HOW TO DESIGN

PNEUMATIC-HYDRAULIC ACTUATION SYSTEMS

THIRD
IN A SERIES
OF ARTICLES

Part III. Designing a pneumatic system for rapid advance, feed cycle and rapid retraction

ONE OF THE MOST USED types of pneumatic circuits is that which provides rapid advance, a feed cycle when work is being performed and rapid retraction of the tool after the work cycle has been completed. There are various ways in which this can be accomplished.

One good example of fast approach, feed and rapid retraction is on drilling machines. Here it is desirable to bring the drill down quickly, perform the drilling, then quickly retract the drill. By using a little ingenuity a layout can be made whereby an operator can operate two or more drilling machines yet not overtax himself. Pneumatic power eliminates the manual labor which would be required to actuate a hand lever or a foot treadle. Once the operator has depressed an electric pushbutton or actuated an air control, he can move to the next machine or perform some other task.

In this article we will introduce two types of cylinders which are often used with the circuits we are discussing, the double-rod, double-acting cylinder and the cushioned cylinder. A double-rod cylinder offers several advantages among which are:

1. Provides better piston support. Instead of the single-rod bearing support, this cylinder has two rod bearings. This is especially helpful for long stroke cylinders or where eccentric loading is encountered.

This type of cylinder is also useful on machine slides, see Fig. 1, where it is desirable to mount a piston rod stationary and have the cylinder move. For such an installation it is wise to use hollow rods, having air passages in them, in order to eliminate long lengths of flexible hose.

2. The second rod can be used to mount tripping mechanisms, tell-tale devices, etc., for effecting certain operations. While the diameter of the piston rods on both ends of the cylinder are generally the same, it is not necessary and sometimes not advantageous to have them the same diameter.

When the rod on the back end is used only for tripping limit switches or for other light duty work, it may be considerably smaller in diameter than the rod which is performing the work. The smaller rod diameter

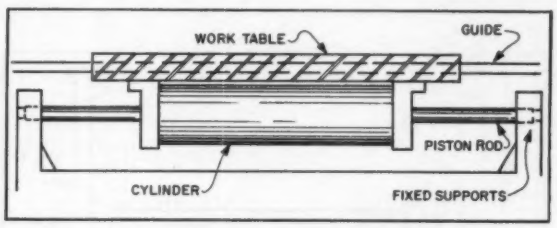


Fig. 1. Use of double-rod, double-acting cylinder on slide.

on the back end of the cylinder provides for a larger effective area on the back side of the piston. This is important as most work is performed on the outstroke of the piston.

3. When there are two rods available it obviates the necessity for putting all the gadgets (mentioned in paragraph two above) on the piston rod that is doing the work. This is important. Gadgets on the main piston rod can clutter up the machine design and may lead to unnecessary trouble.

The disadvantages of the double-rod cylinder are that it requires more space and requires an extra set of packings which must be maintained.

The cushioned cylinder is shown in Fig. 2. Primary

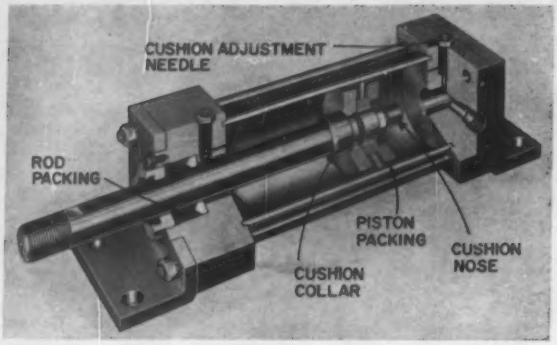


Fig. 2. Cushioned cylinder relieves shock at end of stroke.

purpose of the cushioned cylinder is to relieve shock at the end of the piston stroke. This type of double-acting cylinder may be cushioned on both ends—the rod end and the blind end. Effective cushioning (caused by the air being trapped between the piston and the cover when the port is closed by the cushion nose or the cushion collar) is normally ½ to ¾ in. long.

This cushioning, which slows down the piston movement, is controlled by the cushion-adjustment needle. Cushions normally are not used on a feed device. On non-critical applications cushions perform satisfactorily. This eliminates the need for external valve and piping. Where longer cushioning or feed control is desired longer cushions can be installed.

Figure 3 shows a circuit which may be used for drilling wood or other soft material where controlled feed is required but the degree of accuracy of the controlled feed is not of utmost importance. While in this circuit we make use of a cam-operated flow control, we could, if we wanted to, use a long cushion cylinder.

In this circuit the operator loads the workpiece into the drill fixture E, then momentarily depresses the foot pedal of the four-way valve B. This directs air pressure from the inlet to cylinder port 1, then on to port X of drill press cylinder D. Air pressure forces the piston D forward at a rapid rate until the cam on the tail rod depresses cam roller of valve C. In its normal position, cam roller of valve C will permit exhaust air, leaving port Y of cylinder D, to flow freely through the valve body of C then out the exhaust port of valve B. However, when the cam roller is depressed, the exhaust air passing from port Y is blocked and its only escape is through

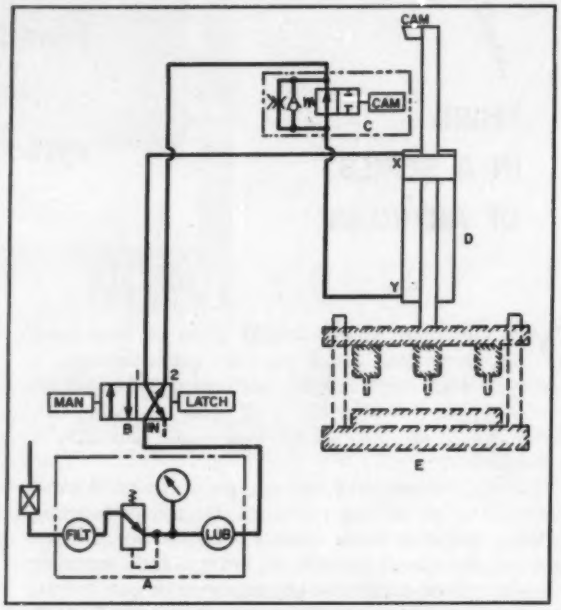


Fig. 3. Drilling soft material with controlled feed rate.

the variable orifice in the body of valve C. Cylinder D is now in the feed cycle for the remainder of the outstroke.

Speed of the feed cycle can be altered by changing the setting of the variable orifice in valve C. This is accomplished by screwing down or retracting the needle. The smaller orifice reduces the rate of feed and the length of the feed stroke depends upon the placement of the cam on the tail rod.

When the piston reaches the end of the stroke, the operator again momentarily depresses the pedal on foot valve B. This causes air pressure to flow from inlet to cylinder port 2, then through the ball check section of valve C (it cannot flow through the main section with the cam roller depressed). Air pressure then flows to port Y of cylinder D, and the piston returns rapidly. When the cam rides off the cam roller, the air pressure is then free to flow through the main section of the valve.

If more drill pressure is desired, the pressure setting

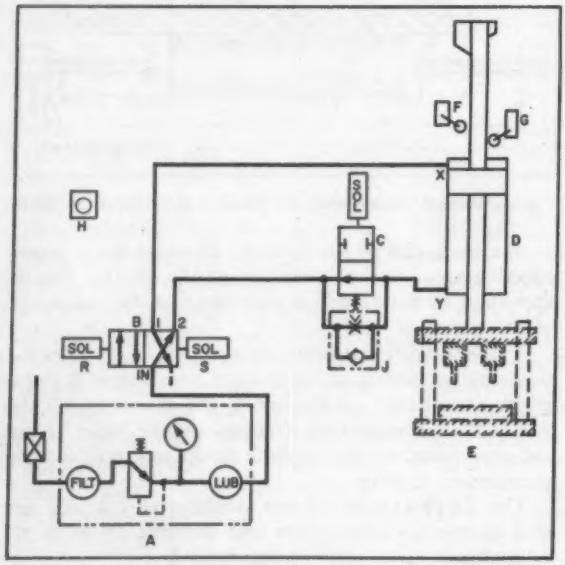


Fig. 4. This all-electric circuit may fit many applications.

of the pressure regulating valve in panel A can be increased until it equals the main line pressure. Some materials will require greater drill pressure than others and the simple adjustment at the regulator accommodates the requirements.

If the application is such that all electrical controls and devices are to be eliminated, then the drill heads can be air-operated. This works very well when certain types of cutters or drills are attached to the drill heads.

In Fig. 4, an all-electric circuit is shown which may prove advantageous for your particular application. To start the operation after the workpiece is placed in fixture E, the operator momentarily depresses electric pushbutton H, energizing solenoid R of valve B. The spool then shifts, directing air pressure from inlet to cylinder port 1 and then to cylinder port X of cylinder D. Piston moves rapidly forward until the cam contacts the limit switch F. Limit switch F energizes solenoid of valve C, thus closing the internal passage in the valve.

Air exhausting from the cylinder must then pass through the variable orifice of valve J and the cylinder piston immediately goes into the feed cycle. As the piston approaches the end of the feed cycle, limit switch G is contacted. This energizes solenoid S of valve B and the spool of valve B is shifted, directing air pressure from the inlet to cylinder port 2, then through valve J when it unseats the check, onto port Y of cylinder D and the cylinder piston rapidly retracts.

Limit Switches and What They Can Do

The use of limit switch F provides instant response when contact is made. It reduces, in most instances, the amount of piping required. Limit switch G provides semiautomatic operation. In this circuit, the operator can load the fixture, momentarily press the pushbutton and then do the same thing on a second drilling machine. By that time the first machine has automatically finished the cycle.

If it is necessary to hold down the material while work is being performed this can be accomplished with spring pads on the fixture or the use of quick-acting clamp.

A sequence valve is a springloaded check valve. When the predetermined pressure is reached in the first cylinder, pressure opens the check in the sequence valve and allows the air to flow into the secondary circuit and actuate a cylinder, air motor, or some other air-actuated device.

Most sequence valves have a built-in bypass so that when the air enters the valve in the reverse direction it can flow freely through it. The pressure at which the check will open is determined by the spring pressure applied against the check. This can be set by the spring adjusting screw. Adjustment makes possible a range of settings from 15 to 150 psi.

With the circuit in Fig. 5, the operator actuates the handle of the four-way, two-position valve B and air pressure is directed from inlet to cylinder port 1 to port R of clamp cylinder E, and piston advances rapidly until workpiece is clamped. Air pressure then builds up, opening sequence valve C, and air flows to port X

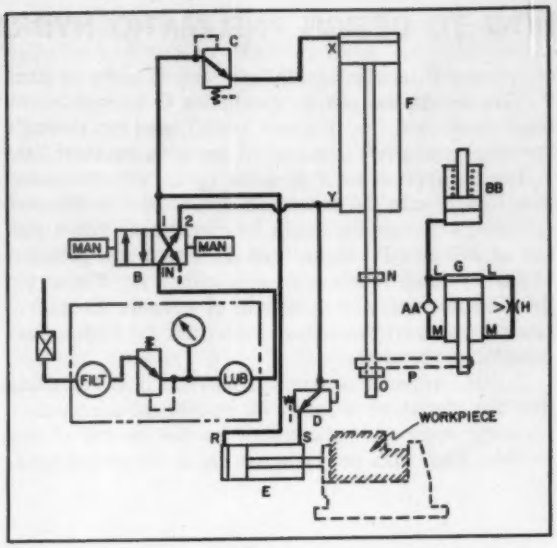


Fig. 5. Sequence, or spring-loaded valve is shown above.

of drill cylinder F. Piston of cylinder F advances rapidly until stop N contacts arm P which is fastened to the dashpot cylinder G.

Oil is forced from port M on through the variable orifice valve H and then into port L. Piston of cylinder F moves at a feed rate set by valve H. The orifice in this valve can be adjusted, by means of a needle, to increase or decrease the volume of oil which passes through it.

When the piston of cylinder F reaches the end of its stroke and the drilling is finished, the operator again actuates the handle of valve B. When the handle has been returned to its original position, air pressure is directed to port 2 and onto port Y of cylinder F. Piston

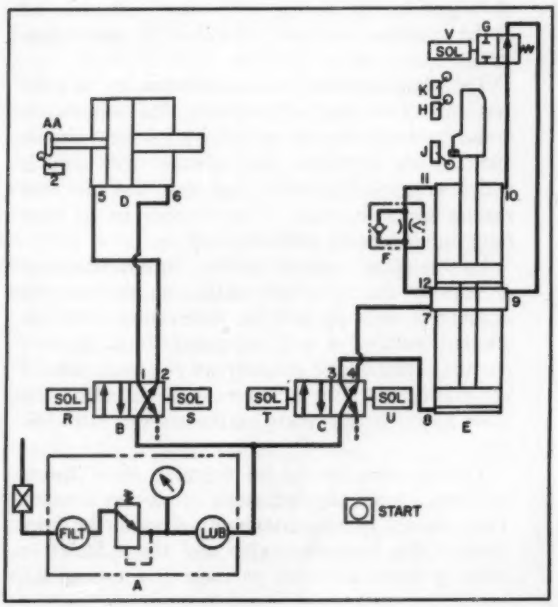


Fig. 6. Circuit setup with solenoid valves, limit switches.

of cylinder F retracts rapidly and stop O picks up arm P. This causes the piston of cylinder G to rapidly retract as oil is forced through port L and on through the check valve AA into port M and into reservoir BB.

The reservoir is used to make up for the difference in volume due to the piston rod. If G was a double-rod cylinder, reservoir BB could be eliminated. When piston of cylinder F reaches end of stroke, air pressure builds up and opens sequence valve D. Then, air pressure flows to port S. Piston of cylinder E quickly retracts and workpiece is released from the clamp, thus completing the cycle.

If there are sudden drops in air-line pressure going into the circuit as a result of insufficient compressor capacity, sequence valves may be the source of the trouble. They may not be actuating at the proper time. In order to eliminate sequence valves it will be necessary to add another four-way control.

Figure 6 is a chucking circuit which sets up the sequence of operation through solenoid valves and limit switches. There can be several variations of this circuit depending upon the chucking requirements. For instance, if the workpiece is to be held between centers, an air operated tailstock cylinder may be added. This cylinder would be the first to actuate in the sequence. The tailstock cylinder forces the workpiece against the center in the chuck.

In the circuit shown in Fig. 6, operator loads workpiece into chuck and momentarily depresses start button. This energizes solenoid R, causing valve spool to shift. Air pressure is thus directed from inlet port to cylinder port 1 of valve B and on to port 6 of chuck-

How a Plant Engineer Converted Machine to Semi-Automatic Operation

HERE IS AN instance where a plant engineer really proved his ability to effect a sizeable savings for his company—converting an old manually-operated machine into a semi-automatic or completely automatic machine. The plant had a drilling machine in which it was necessary for the operator to push down on a long lever to actuate the drill table.

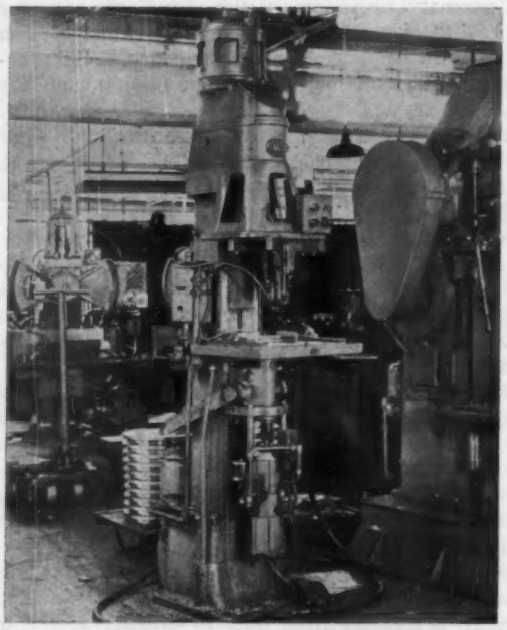
On operations which required more than the normal amount of drill pressure, the operator would attach a length of pipe to give added leverage. Production was fairly good for the big brawny type of operator but even he would show signs of fatigue late in the day. The operator had to be at the machine constantly to attain his production rate.

The plant engineer saw an opportunity to convert this older type of machine into semi-automatic operation by the use of a pneumatic circuit and electric controls. The electric foot switch which controls the valve and feed cylinder for raising the table would allow the operator to have both hands free to load the drill jig.

In this plant's operation they drill workpieces of various materials and shapes so that in one instance a drill jig will be rather thin while in another instance it may be rather thick. By employing a pneumatic cylinder on the back side of the drilling machine the operator could adjust the table height to take care of the various size drill jigs.

The cylinder would be actuated by a three-position, manually-operated, four-way valve. There would be speed control valves in the lines between the four-way valve and the cylinder in order to move the table carriage at a low speed. When the table is at the correct height the handle of the four-way valve would be shifted to the neutral position. This would stop the cylinder movement and the operator could then manually lock the lower table carriage guide and be ready to set up for drilling.

The front of the drilling machine and the air-hydraulic cylinder which feeds the table toward the drill heads is shown. The piston rod of the



Air-hydraulic cylinder feeds table toward drill heads.

ing cylinder D. Air pressure then forces piston to retract and thus causes chuck to grip work.

As cam (swing type) AA passes over limit switch Z, solenoid T is energized and air pressure flows to port 3 of valve C. From here it goes to port 8 of air-hydraulic feed cylinder E. Piston of this cylinder moves forward at a rapid rate until limit switch H is contacted. When roller of limit switch H is depressed, solenoid V of two-way valve G is energized. This valve which is normally open is now closed. This closes port 9 and port 10 and the only flow in the closed hydraulic section of the air hydraulic circuit is through the orifice in valve F.

Oil that is forced from port 11 flows into port 12 and the piston moves at a controlled feed for the balance of the stroke. At the end of the stroke, limit switch K is contacted. This energizes solenoid U of valve C, shifting this valve to its original position. Air pressure is thus directed to port 4, then to port 7 of cylinder E. Piston rapidly retracts as check in valve F is unseated and oil freely flows from port 12 to port 11. Near the end of the return stroke, cam (swing type) momentarily trips limit switch J. This energizes solenoid S of valve B and air pressure flows to port 2 and then to port 5 of cylinder D. Cylinder piston moves forward and chuck releases workpiece, thus completing the cycle.

Swing type cams are used so that the limit switches are only tripped in one direction of the cam movement.

In place of electric controls and valves, small pilot valves could be used in conjunction with pilot-operated, four-way controls. We will dwell on this in a later article.

Part IV will cover a more complex movement of the tool to the workpiece. **End of Part III**

cylinder is connected to the table bracket. The cylinder is mounted to the bracket on the carriage by two shafts.

In explaining the operation of the pneumatic system follow the circuit. In setting up the machine, the operator can move the table up by momentarily depressing electric foot switch A. This energizes three-way pilot valve B which in turn causes spool of valve D to shift and air pressure is directed to port 1 of feed cylinder J. Pistons of cylinder J start to move as oil is forced from port 5, and the oil then moves through normally open two-way valve L and on through normally open two-way valve K into port 3.

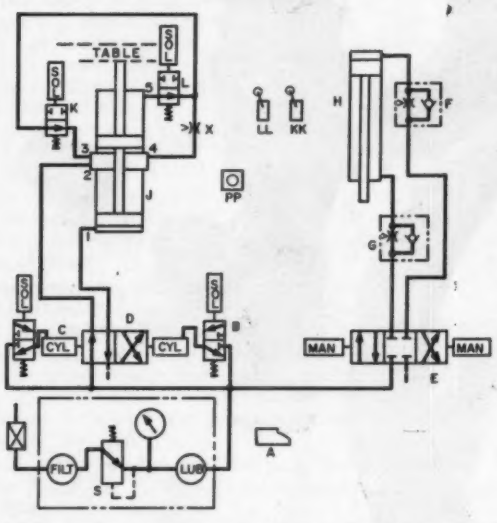
Operator can stop movement by merely pushing stop button PP which energizes solenoid of valve L. He can then check his drills and set his cams and stops. If he is using a box type jig, which is rectangular, he can set one cam for one drill-depth, the second cam for another, and the third for still another.

In operation, after the set up, the operator places the workpiece in the jig, shoves the jig into position and momentarily depresses foot switch A. The movement of the cylinder starts out the same as for the set up except as the drills approach the workpiece a cam causes the solenoid of valve K to become energized when limit switch LL is actuated and the passage in valve K is closed. Oil is then forced through variable orifice valve X into port 4 and the travel speed of the table for the drilling operation is controlled by the setting of valve X.

As the drill depth is reached, the solenoid of valve C is energized when limit switch KK is actuated, which causes spool of valve D to shift and air pressure is directed to port 2 of cylinder J, and the piston retracts rapidly due to the check valve in oil piston of cylinder. As the air piston approaches the retracted position, the cushion nose on the end of the piston rod enters the cushion recess in blind cover and piston stops without shock, thus completing cycle.

Drill pressure may be increased or decreased by changing the setting of the regulating valves.

By changing over from manual operation to pneumatic operation time studies show an increase in production up to 100 per cent was effected. The greatest amount of time savings was reported to be in the handling. The operator had his hands free at all times. Also in the rapid approach of the table to the drills, the table did not go into feed until after the drills entered the drill bushings.



Circuitry setup to convert machine to semi-automatic.

The big blaze leveled both plant and warehouse . . . nearly a 100% loss of stock! And then . . .

Along came Jones

Tuesday morning—I was just starting off on my calls when the bad news came over the radio:

Fire—a big one—was burning the Niagara Transformer Corporation to the ground! Niagara makes transformers in Buffalo.

Niagara is also my customer. I'm Bud Jones—salesman for Rome Cable.

My first reaction: get over there . . . quick! But when I arrived the damage had already been done. There was nothing to do but wait . . .

Tuesday evening—the details were in the paper. In less than two hours, fire had completely destroyed both plant and warehouse—and nearly one hundred percent of stock.

Wednesday morning—just 24 hours later—Niagara had selected an existing building, signed the lease, and started planning the layout. That's where I came in.

Thursday noon—I got the word. They needed wire and cable for an emergency installation, needed it fast. Niagara's new building had *no* power whatsoever. "Can Rome handle *all* the power requirements?" I was asked. "You bet!"

Thursday, 2:15 P.M.—I relayed the order back to our plant at Rome, N. Y. Voltage requirements. Cable size. Distance to be covered.

Part of the order could be made up from stock. But a special power cable—that had to be strung overhead in the new plant, out the skylight, across the roof, through another skylight and down to the transformer—had to be self-supporting and specially made.

Our engineers came up with a quick—and unique—answer. They had three conductors spiralled around a high-strength messenger. That was done in the Rome plant to save Niagara time on the job.

Thursday, 3:30 P.M.—order completed!

Friday morning—after testing—it was shipped.

Just seven days after the fire, Niagara was on its feet again, winding coils for transformers with Rome magnet wire, which we also supplied in a jiffy!

As Herman E. Gabel, Jr., General Manager at Niagara, said: "Rome did a wonderful job in getting us the cable we needed . . . but that's not startling for Rome! We've felt we could always depend on Rome for quick delivery and imaginative engineering."

MEET THE MAN

WHO'S DEDICATED TO YOUR JOB

YOUR ROME CABLE SALESMAN

Bud Jones' action typifies the type of service you can rely on from your Rome Cable representative. He links you directly and quickly with the facilities and engineering skill at Rome—not only during emergencies but every time you have a wire and cable requirement. When you need help, call your Rome salesman!

ROME CABLE

CORPORATION

For more facts circle 559 on Reply Card

Plant engineers from the Pasadena area form the Rose Bowl Chapter of the AIPE.

ROSE BOWL CHAPTER FORMED

Becomes 50th Chapter of AIPE

PLANT ENGINEERS from the Pasadena, California, area attended a meeting on October 29 to form the 50th chapter of the American Institute of Plant Engineers. It will be identified as the Rose Bowl Chapter of the AIPE.

Bert P. LaForge, superintendent of buildings and equipment, Consolidated Electrodynamics Corporation, was elected president of the chapter for a one-year term.

Other officers named at this meeting, were: Donald D. Daley, vice president; Charles R. Martina, secretary; and T. Gordon Meikle, treasurer.

James M. Weeks, vice president of the AIPE, installed the new officers. Weeks is the plant engineer for Proto Tool Company, a Division of Pendleton Tool Industries, Inc., Los Angeles.

Also attending the meeting were: Richard H. Morris, Editorial Director of PLANT ENGINEERING, and the first national president of the AIPE; Thomas H. Hardgrove, plant engineer at Northrop Aircraft, Inc., and past president of the Los Angeles Chapter; and members from the Los Angeles, Orange County chapters.

Members of the Rose Bowl Chapter pictured above, are: Seated, left to right: B. P. LaForge, superintendent of buildings and equipment, Consolidated Electrodynamics Corporation; D. D. Daley, assistant superintendent of buildings and equipment, Consolidated Electrodynamics Corporation; C. R. Martina, plant engineer, Hycon Manufacturing Company; and T. Gordon Meikle, director of plant engineering services division, California Institute of Tech., Jet Propulsion Laboratory.

Standing, left to right, are: G. A. Swartz, engineer, and P. N. Cotton, engineer, both of Sears, Roebuck and Company, Pasadena and El Monte, respectively; L. George, plant engineer, Holly General Company; W. L. Edmonds, plant engineering foreman, Consolidated Electrodynamics Corporation; W. H. Stine, plant engineer, United Electrodynamics, Inc.; and H. Wassermann, plant layout draftsman, Consolidated Electrodynamics Corp.

Bert P. LaForge will serve as president of the chapter for the coming year.

Other chapter members not shown in the picture above, are: G. W. Beard, project engineer, National Utilities Corporation; J. P. LaForge, industrial engineer, General Petroleum Corporation; and R. G. Prescott, plant superintendent, National Utilities Corporation. **End**

For more facts circle 560 on Reply Card ⟶

No trouble calls with PUSHMATIC

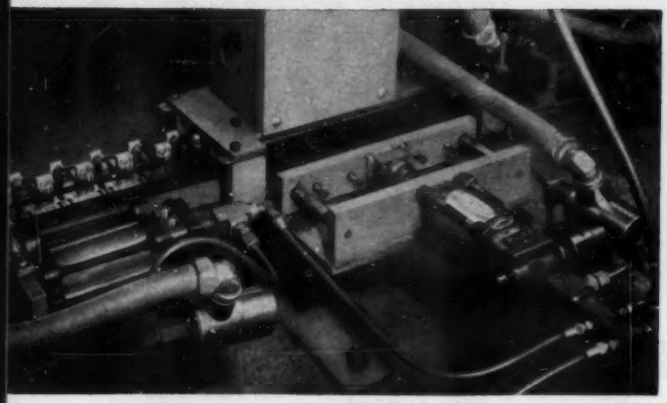
Every breaker is individually performance tested

Browse along our production line and it will be apparent why this circuit breaker has earned the reputation as the *safest and most dependable* on the market. Following are five of the dozen or more exhaustive checks and quality controls the Pushmatics undergo — over and beyond those required by Underwriters'.

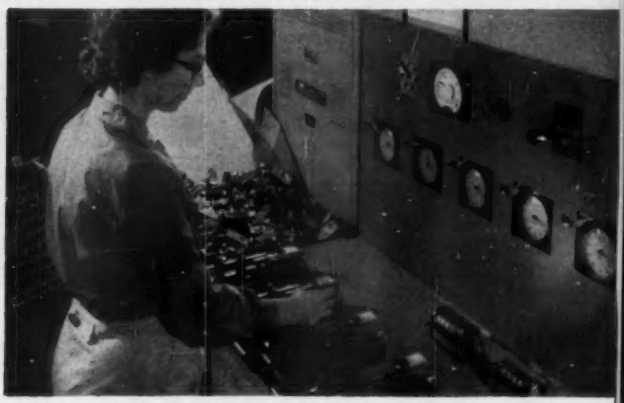
BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

1. CALIBRATION In a dust-free room, where temperature is maintained at a constant 75°, operators calibrate *every* Pushmatic bi-metal assembly on a special optical viewer. Each bi-metal "latch" is adjusted to a dimensional accuracy of 1/1000 of an inch. Prior to this, the bi-metal had been heat-treated in an inert atmosphere to relieve stresses, "normalize" the metal.

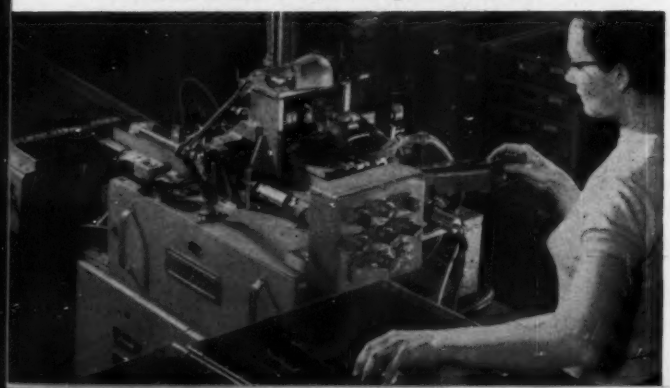


2. MECHANICAL BREAK-IN After assembly every Pushmatic is operated 50 times to make absolutely sure it functions well mechanically. Ten break-ins would be adequate . . . the extra 40 give you that much more assurance that it will never fail in manual or automatic operation.

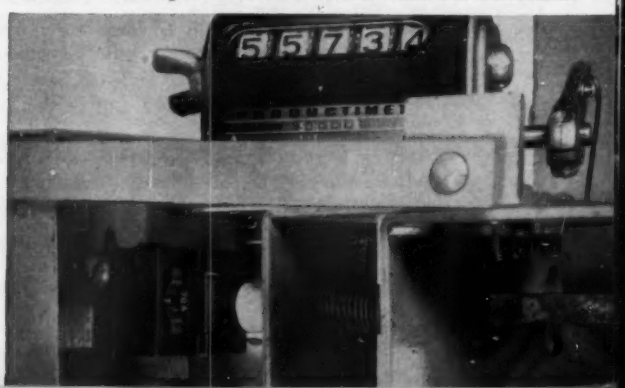


3. CALIBRATION UNDER LOAD Brought back to its "set" temperature, each breaker is checked at 200% of rated current, and again at the equivalent of 125% of rating. Check Boards are accurate to 1/10 of a second. Samples from each production run are also tested at 100% of rating.

4. SHORT CIRCUIT TEST Being thermal-magnetic devices, Pushmatics then undergo severe short circuit currents to test the instantaneous trip time of the magnetic element. If a breaker fails to trip within .02 seconds, it is automatically rejected by the machine. Extra safety, extra performance.



5. ENDURANCE TEST Underwriters' Laboratories run periodic endurance tests on BullDog Pushmatics®. The requirement — 10,000 operations, 6000 under load and 4000 with no load. But BullDog constantly checks out the breakers at 50,000 or more operations. *End trouble calls. Use Pushmatic!*



ALL ENGINEERS DINNER

Guest Speaker: E. J. Peltier, Rear Admiral, USN

PLANT ENGINEERS attending the 1960 Plant Maintenance and Engineering Conference and Show in Philadelphia in January will want to include the All Engineers Dinner on their calendar of events. It will be held on Tuesday evening, January 26, in the Grand Ballroom of the Sheraton Hotel.

The dinner is sponsored by the American Institute of Plant Engineers. The Philadelphia Chapter of the AIPE will serve as host for this event. Members of the Philadelphia Chapter appointed to this committee are: John M. Waligora (chairman) Merck Sharp & Dohme, Division of Merck and Company, Inc.; George M. Colajezzi, S. F. Whitman & Sons; Howard W. Leadbeater, American Pulley Company; Owen J. Nugent, Jr., Samuel M. Langston Company; James E. Dooley; and Charles Johnston, Lansdale Tube Company.

This will be one of the highlights of the annual conference and show and will offer you an opportunity to get away from the business end of the program and relax a little. You will also have a chance to meet old acquaintances and make new ones.

Featured speaker at the dinner will be Rear Admiral Eugene J. Peltier, Civil Engineer Corps, U. S. Navy. His talk will be on the subject: The Navy and Plant Engineering.

The talk should prove very interesting since the speaker has collected a wealth of information from the many engineering experiences and positions he has held in the service.

Some of his more recent positions have been as District Public Works Officer and Officer in Charge of Construction at the Fourteenth Naval District, Pearl Harbor; Public Works Officer for the Naval Base; and District Housing Administrator.

From July 1953 to December 1953 he was Executive Assistant to Assistant Chief of Operations, Bureau of Yards and Docks, Navy Department, Washington, D. C., and was Assistant Chief of Maintenance and Material from December 1953 until February 1956. He was later made Commanding Officer of the Naval Construction Battalion Center, Port Hueneme, California.

On October 30, 1956, he was appointed Chief of the Bureau of Yards and Docks and Chief of Civil Engineers of the U. S. Navy, the position he now holds.

Admiral Peltier will discuss the subject "The Navy and Plant Engineering."

In addition, you will have an opportunity to meet the national officers of the American Institute of Plant Engineers. They are: William C. Wallin, Western Electric Company, Inc., president; James M. Weeks, Proto Tool Company, vice president; Fred G. Fryberger, Food Machinery and Chemical Corporation, secretary; and Leo Monty, Artisan Metal Products, Inc., treasurer.

You will also be introduced to the new officers of the AIPE who will be elected at the January meeting but will not take office until June of next year.

Included on the dinner program will be the presentation of the American Institute of Plant Engineers Fellow Award. This award is made to honor an individual or individuals for contribution to the profession of plant engineering.

To be sure that your dinner reservation is in early, you may wish to use the coupon on this page. Kindly note that the tickets for the dinner will be $8.00 on an advance sale basis and $8.50 if purchased at the conference. **End**

Mr. Howard W. Leadbeater
American Pulley Company
4200 Wissahickon Avenue
Philadelphia 29, Pennsylvania

Kindly send me ..... tickets for the All Engineers Dinner of the American Institute of Plant Engineers to be held at the Sheraton Hotel, Philadelphia, Pa., at 7 p.m. on Tuesday, January 26, 1960. Price: $8.00 per person.

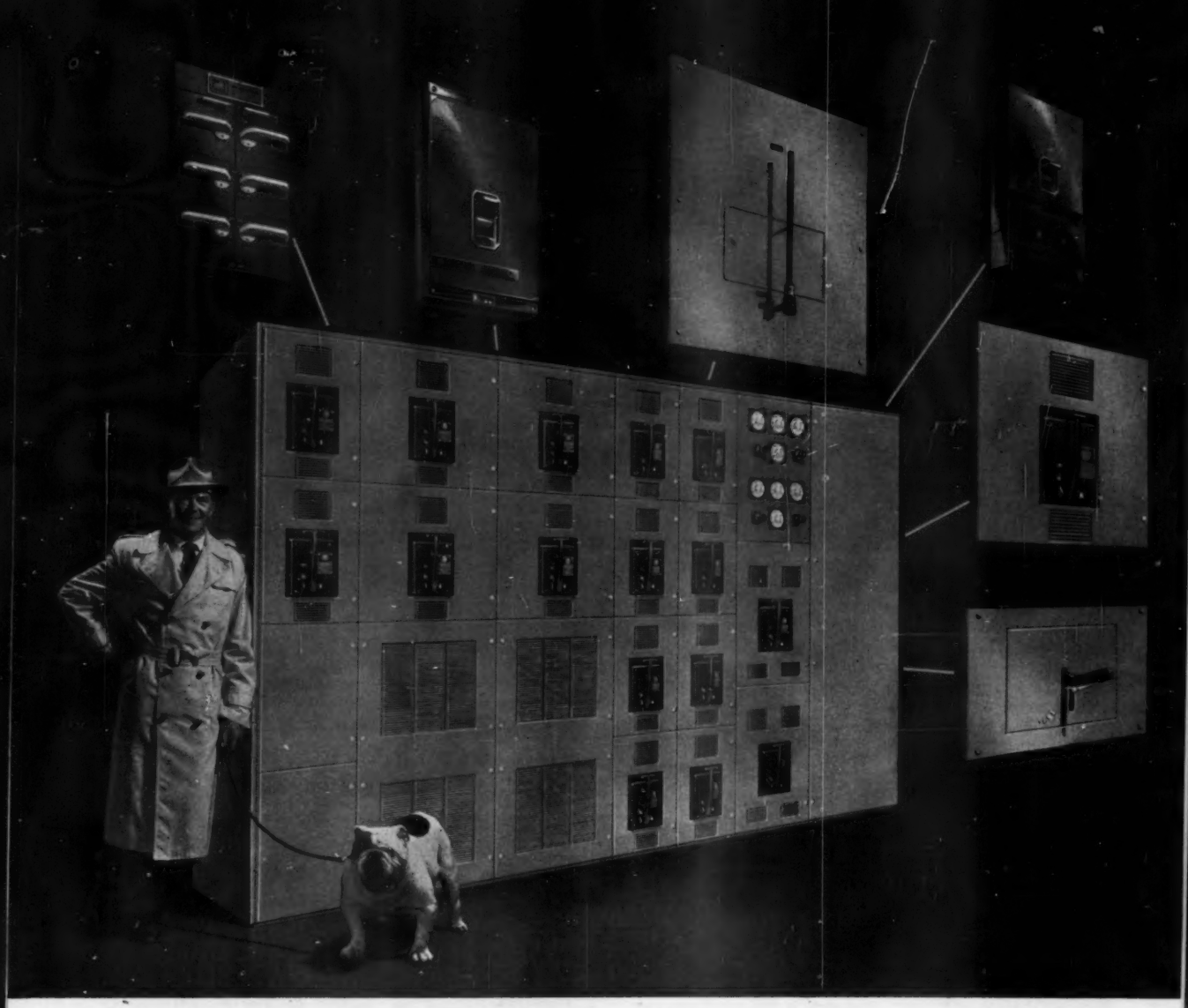
☐ Check ☐ Money Order is enclosed for the reservations indicated above. (Make check or money order payable to the American Institute of Plant Engineers.)

..... Name

..... Company Address

..... Company

..... City — State



ANNOUNCING: THE NEW BULLDOG DF-60
UNCHALLENGED FOR VERSATILITY

BullDog's new DF-60 lets you put everything from large air circuit breakers to small Vacu-Break® units in one space-saving enclosure. It will handle any of the following light-duty or heavy-duty switch units . . . in any combination:

- New I-T-E K-line back-connected air circuit breakers, 225 to 4000 amperes
- I-T-E Molded Case Circuit Breakers, back-connected or panelboard-mounted, 15 to 800 amperes
- I-T-E Cordon* Circuit Breakers, back-connected, 15 to 600 amperes
- Fused Pressure Switches, back-connected, up to 4000 amperes
- BullDog DF-30 fused switches, back-connected, 30 to 1200 amperes
- BullDog Vacu-Break® units in panelboard mounting, 30 to 600 amperes

In addition there is room for current-transformer equipment and metering systems.

A call will bring your local BullDog field engineer to assist you in selecting the type, combination and arrangement of units needed to handle your power load . . . help supervise installation. You'll find the new DF-60 is easy and economical to install, too. Bus duct systems up to 4000 amperes can be connected directly to the board. For complete details send for Switchboard Bulletin SB-555.

*Trademark registered by I-T-E Circuit Breaker Company

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY
BOX 177 • DETROIT 32, MICHIGAN

In Canada: 80 Clayson Rd., Toronto 15, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

For more facts circle 561 on Reply Card

Foamed Silica Block Replaces Steel in Furnace Baffle

LIGHTWEIGHT, acid- and heat-resistant, a foamed silica material has solved a design problem in Petro-Chem Development Company's Iso-Flow furnaces. In one of their applications, these furnaces are used in the oil refineries, to heat the crude oil before it is fed into the fractionating towers.

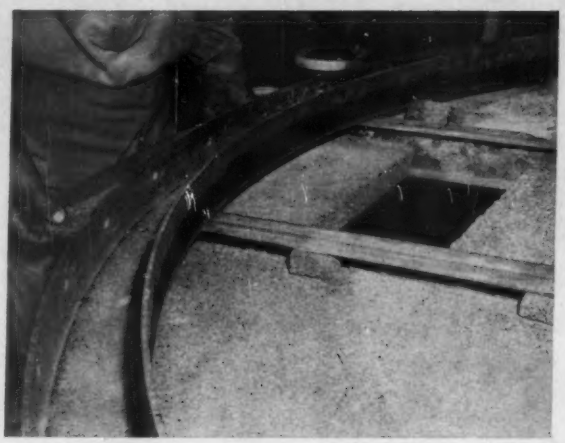
The furnace is cylindrical, and a baffle hung at the top retains the heat. Fuel oil or gas, burned at the bottom of the furnace, is the source of this heat—most of which is transmitted to the oil flowing through tubes in the furnace.

Baffles constructed of insulated alloy steel did not stand up under the heat. Bottom temperatures in the furnace range as high as 2000 F, and as the gases reached the top of the furnace, they were often at a temperature of 1300 F.

Sulfur and vanadium in the fuel oil burned to produce vanadium pentoxide, which was highly destructive to the steel. Foamsil, a fused silica product of the Pittsburgh Corning Corp. was used to construct the baffle itself, rather than using a solid steel baffle and insulating it.

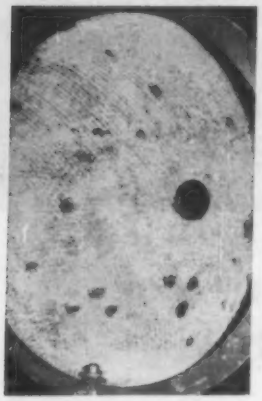
Blocks of the silica (17 by 22 in.) were slid into alloy steel channels mounted on a circular framework to form a solid cover. Edge units were cut in the field to fit the circular shape of the baffle.

Petro-Chem reports that the foamed silica is appreciably



cheaper than the steel it replaced; it is not expected to require replacement because of corrosion; it is easy to install, saving at least 25 per cent in man-hours needed to assemble a baffle.

Special Headgear for Atoms



THIS MAMMOTH metal "head" has become the upper portion of the reactor vessel which contains the atomic core of the N.S. Savannah, world's first nuclear-powered merchant ship.

The head was formed by the Boiler Division of The Babcock & Wilcox Company from a circular steel plate weighing 34,860 lb. It required seven hours of heating in a furnace to bring its temperature up to 2200 F before forming in a 6500-ton vertical press.

Largest Stainless Steel Impellers

SEVEN STAINLESS steel impellers, each weighing close to 10,000 lb were recently shipped by Worthington Corporation, Harrison, N. J., to the Metropolitan Water District of Southern California.

The impellers, each having a diameter of 82 in., are installed in Worthington vertical volute centrifugal pumps. The units pump water from the Colorado River throughout Southern California for irrigation, sanitation and drinking. Each pump handles 96,750 gpm against 400 ft head.

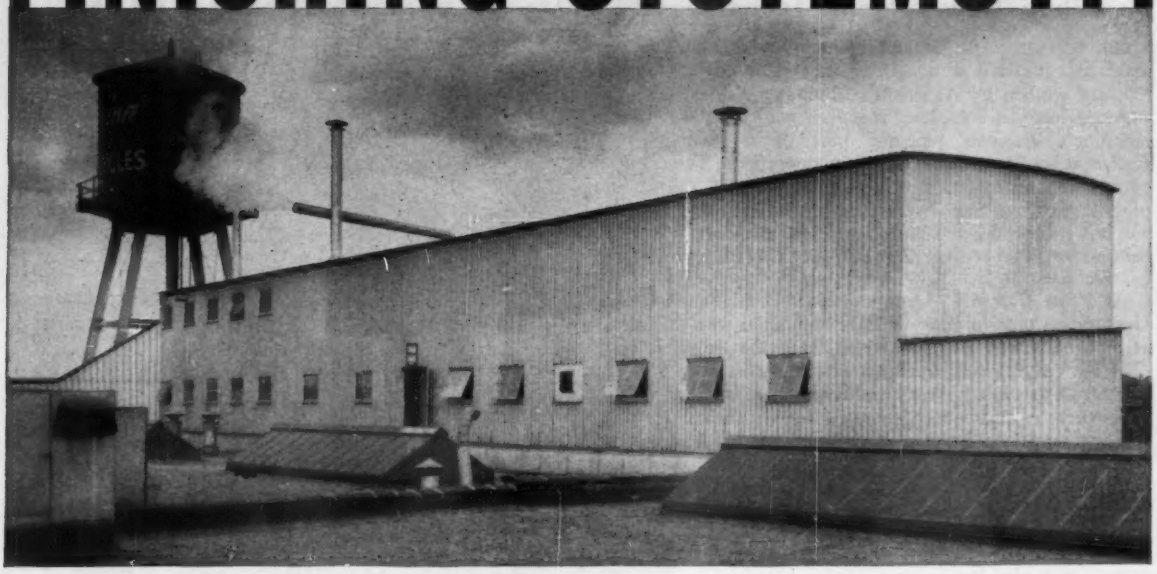
"Quiet Room" Is Feature of New Plant Producing Signal Devices

MOVING ITS GENERAL OFFICES and Chicago production operations into a modern one-story plant in suburban Blue Island, Illinois has enabled the Federal Sign and Signal Corp. to incorporate the latest in production and testing equipment into their operations.

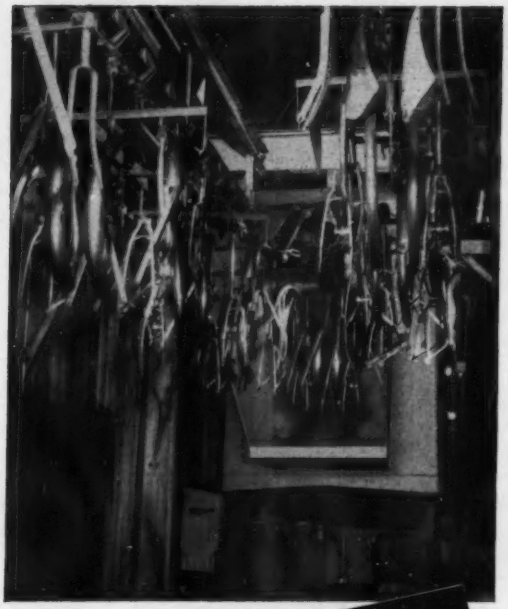
The new 164,000-sq ft plant contains the country's most extensive and up-to-date facility for the design and manufacture of audible and visual signals for industry and government.

As part of its engineering facilities, the company has installed an anechoic chamber, largest in the signal industry, in the new location. Designed to test all types of signals from small buzzers to Federal's giant Thunderbolt air raid sirens, the room has walls, ceilings and floor covered completely with wedges of fiberglass sound-absorbing material.

FINISHING SYSTEMS...



Self-Housed Equipment Installed on Roof Saves Over 10,000 Sq. Ft. of Manufacturing Floor Space!



Over a period of twenty-three years the Mahon company has worked in close cooperation with Arnold, Schwinn & Co., manufacturers of famous Schwinn Bicycles, in developing finishing equipment which now produces what is acknowledged the highest quality finish, the most durable finish, and the finest appearing finish in the industry.

The three Finishing Systems installed by Mahon in the past twenty-three years have saved Arnold, Schwinn & Co. over 10,000 Sq. Ft. of valuable manufacturing floor space inside the company's two-story plant. In the first Finishing System, installed in **1936**, only the Spray Booths were located inside the plant; other units, including two Finish Baking Ovens together with Heating Equipment, Recirculating Fans, etc., were housed on the roof.

In **1950**, another complete self-housed Prime-Coat Finishing System, shown above, was installed in its entirety on the roof—the design being a two-level arrangement with Dry-Off Oven, Finish Baking Oven and Heating Equipment Room on the upper level. This System handles Cleaning, Rust Proofing and Prime Coating of all parts produced which receive their 2nd and 3rd or final coat in the other two Finishing Systems.

In **1956**, a third Finishing System was installed with 2nd Coat Finish Baking Oven, Cooling Area, 3rd or Final Coat Finish Baking Oven and Heating Equipment Room located on the Roof. Electrostatic Spray Booths for this System were located on the second floor of the plant directly below.

When you consider buying a new finishing system, or any unit of finishing or processing equipment, you, too, will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the initial planning and engineering which plays such an important role in the ultimate operating efficiency of specially designed equipment of this type.

See Sweet's Plant Engineering File for Information and Representative Installations, or Write for Catalogue A-660

THE R. C. MAHON COMPANY • Detroit 34, Michigan
Sales-Engineering Offices in Detroit, New York, Chicago, Los Angeles and San Francisco

. . . the **EXPERIENCE** that goes into the **PLANNING** and **ENGINEERING** of **MAHON EQUIPMENT** is the item of **GREATEST VALUE to YOU!**

MAHON

For more facts circle 562 on Reply Card

New Pipe, New Welding Techniques Team Up To Cut Pipeline Costs

OIL COUNTRY USE of aluminum pipelines on a major scale has received a boost, as the result of techniques recently applied by Aluminum Company of America.

Alcoa has just completed installation of a 4500-ft long, eight-inch diameter pipeline, part of a gas-gathering system at its Point Comfort, Texas operations. Two developments—Unistrength pipe and a high speed, automatic pipe welding machine—were used for the first time. Buried without protection, the aluminum line cost only four per cent more than coated and wrapped steel lines of comparable size.

At Point Comfort, Alcoa utilized 8-inch, Schedule 40 Unistrength pipe in alloy 6063-T6. Nominal wall thickness at pipe ends was .322 in., while along the length it was .204 in. Varying wall thickness cut pipe cost 20 per cent, compared to similar lines installed in the past.

Further savings were generated by an automatic pipe welding machine, designed and developed by Alcoa. The welder is capable of producing sound welds, with full penetration, without the use of back-up rings. This gain in welding technique, plus high welding speed (the unit completes a pass on 8-in. pipe in just 17 seconds) achieved less costly pipeline joints with great rapidity. Over-all effect was to cut pipe-laying time.

Lavaca Pipe Line Company installed the new line, using 40-ft sections of pipe. The line, which will carry dry gas at a pressure of 500 pounds per square inch, conforms to the requirements of the ASA code for pressure piping.

Central Heating Controls Save Steam, Reduce Man-Hours, Improve Operations

THE PLANT ENGINEER at Westinghouse Electric Corporation's East Pittsburgh, Pa., works has calculated that 1300 man-days per year and 150 million lb of steam per year are saved by using central control equipment for the steam heating system.

The central control panel consists of resistance thermometers, control relays, and motor operated steam valves in addition to a recording thermometer and 75 pushbutton control stations.

This system enables one man to "patrol and control" the entire heating system from a single point. Previous arrangements required a man to walk a four-hour beat. Steam can be shut off from any area as soon as it is no longer needed, and the entire heating system can be shut down in one minute, if necessary.

Industrial Building Framed in "Fireproofed" Lumber Structurals

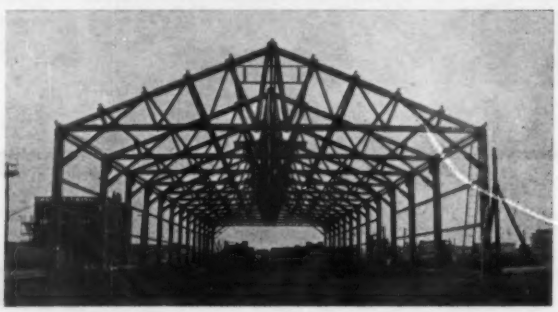
A NEW ENTRY IN THE FIELD of industrial construction, and unique in its fireproof construction, a wood-and-aluminum structure has been designed and constructed by the Cross, Austin & Ireland Lumber Co., Brooklyn, N. Y. It is expected to be fully competitive with conventional buildings for such uses as industrial plants and warehouses.

Structural framework of the building is pressure-impregnated wood and the exterior is of ribbed aluminum siding and corrugated aluminum roofing supplied by Alcoa. The street side of the building is finished in spruce green Alumalure siding.

According to the builders, the structure was erected for 10 to 15 cents per square foot less than comparable steel construction. Insurance rates will also be lower, due to the fireproofing impregnation of the timbers.

The entire wood structure was precut to final or near final size, incised to assure deep penetration of the fire-retardant solution, then pressure treated by vacuum-pressure process using pressures and temperatures necessary to assure thorough penetration. The stock was allowed to season between treatment and fabrication.

Each truss and wall section was assembled with bolts and ring connectors on the ground, then hoisted in place by crane. After the entire skeletal structure was in place, the roofing and siding were applied directly.

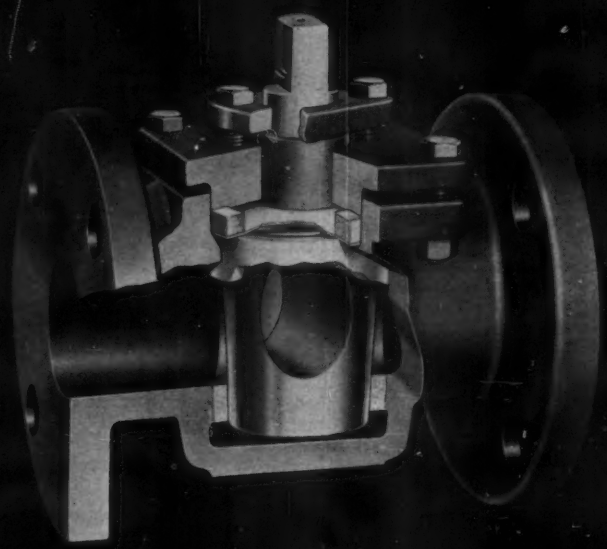


WHAT USERS SAY ABOUT THE NEW DURCO TYPE G SLEEVELINE

The new Durco Type G SLEEVELINE is a non-lubricated plug valve. A Teflon sleeve is pressed into a ductile iron or stainless steel body; a machined plug, Teflon diaphragm and gasket, a thrust collar, and a self-aligning adjuster make up the rest of this trouble-free, non-lubricated plug valve.

Available in ductile iron or stainless steel, screwed or flanged ends from ½" through 2", and in ductile iron flanged ends 3", 4", and 6". 150 psi rating.

Write for bulletin V/12.



sulfuric acid service

"Entirely satisfactory in service on 66°Bé sulfuric acid after 8 months."

latex user

"Valve on Latex service since May 1, has given no trouble. Other valves (gate, globe, ball, wedge, lift plug) failed because Latex build-up froze the valve."

chlorine gas service

"In service for ten months on chlorinator handling dry chlorine gas at 50 psi —ambient temperature. Formerly used lubricated valve which gave considerable trouble due to freezing."

caustic service

"Valves used on cell liquor, concentration 12%, at 160°F. After one month valve was removed and inspected. All movable parts were free, no wear was evident. Valve was reinstalled and has been in six months continuous service with completely satisfactory performance."

phosphorous user

"Used on yellow phosphorous at 160-200°F. Valves are doing fine. Thanks for a product that works—and a valve that I can turn with one hand without breaking my back."

solvent handling

"Valves performing very well on toughest solvent service after five months, where lubricated plug valves were regularly replaced due to sticking caused by leaching out of lubricant."

DURCO
CORROSION RESISTING ALLOYS & EQUIPMENT

THE DURIRON COMPANY, INC., Dayton, Ohio

Valves • Pump • Filters • Process Equipment

For more facts circle 563 on Reply Card

NEW PLANT CONSTRUCTION —advance information on location, costs

Guin, Ala.—Minnesota Mining & Manufacturing Co., 900 Bush Ave., St. Paul, Minn., plans to construct a plant here for the production of reflective tape. Plant will be erected close to existing facilities at a cost of about $1.3 million. Work will get under way this year for completion by the latter part of 1960.

Montgomery, Ala.—Foremost Dairies, Inc., 417 Bell Street, plans to construct a milk processing plant on building site located here. Proposed project, which will get under way as soon as preliminary engineering work is completed, is expected to cost about $1 million, with equipment. Plant is scheduled to go into operation by late 1960.

Dierks, Ark.—United States Glass & Chemical Corp., Fourth and Vine Streets, Tiffin, Ohio, plans to construct a mill here for the production of barite for weighted drilling mud and other outlets. Initial production of the facility will be 35,000 tons a year, with a by-product of 250,000 tons a year of various types of commercial gravel. The mill, to cost about $500,000, will be in production in the summer of 1960.

Riviera Beach, Fla.—Minneapolis-Honeywell Regulator Co., 2954 Fourth Ave., S., Minneapolis, Minn., plans to construct a research and development center in this city. Facility will be a one-story concrete and steel frame structure with a floor area of about 40,000 sq ft. Work on the new structure will get under way soon for completion by the summer of 1960. Plant will be equipped for pilot production of newly developed products, but production of company's existing transistor line will continue in Minneapolis. Plant will cost $1 million.

Santa Cruz, Calif.—Sylvania Electric Products, Inc., a subsidiary of General Telephone & Electronics Corp., plans to construct a plant for the manufacture of computer components. The new plant will have a manufacturing area of 32,000 sq ft and will be constructed of concrete block. Work, now under way, is scheduled for completion by the fall of 1960.

Chicago, Ill.—AMF Pinspotters, Inc., a subsidiary of American Machine & Foundry Co., 261 Madison Ave., New York, N. Y., plans to construct a 210,000-sq ft manufacturing plant for bowling balls, pins and other equipment. Plant will be located on an 18-acre tract in northwest Chicago. New facility will be used for warehousing and sales as well as the training of bowling proprietors and servicemen.

East Peoria, Ill.—Chris Hoerr & Son, 1321 S. W. Washington St., Peoria, Ill., will construct a warehouse and coffee roasting plant. It will be a one-story concrete and steel frame structure of approximately 140,000 sq ft. When completed late in 1960, plant, with equipment, will represent an investment of approximately $1 million. Frank Heinz Construction Company, 2506 W. Adams St., Peoria, Ill., has the construction contract.

Wilmington, Ill.—Personal Products Corp., Division of Johnson & Johnson, 6401 W. 65th St., Chicago, Ill., plans to construct a manufacturing plant on large site here which will include warehouse facilities, administration offices, company cafeteria, and a large parking area for employees. Work on the new facility is under the supervision of Joseph T. Carp, 5640 N. Northwest Highway, Chicago. Building is scheduled for completion by late 1960 and will represent an investment in excess of $3 million.

Portage, Ind.—Midwest Steel Corp., Division of National Steel Corp., Grant Building, Pittsburgh, Pa., has announced a contract award in the amount of $15 million to the Walsh Construction Co., Davenport, Iowa, and the Eichleay Corp., Pittsburgh, Pa., for the construction of company steel mill at this location, including foundation work and sewerage facilities. Work will begin soon on the new facility.

Louisville, Ky.—Enro Shirt Company, subsidiary of Wilson Brothers, 1010 S. Preston St., this city, plans to construct a manufacturing plant to cost approximately $1 million. New one-story plant will have a floor area of about 120,000 sq ft and will be of concrete construction with aluminum siding. Work will get under way at once for scheduled completion by the fall of 1960.

Louisville, Ky.—Ford Motor Company, American Road, Dearborn, Mich., plans to construct a one-story concrete block and slab warehouse for automobile parts. It will be erected adjacent to company's existing assembly plant located on Grade Lane, this city. Plans call for the construction of a 216,000-sq ft facility which will cost in excess of $1.5 million. Work is already under way for completion scheduled late in 1960. Cunningham-Limp Co., 3087 W. Grand Blvd., Detroit, Mich., has been awarded the construction contract.

Louisville, Ky.—Shuler Axle Co., Inc., 2901 S. Second St., plans to construct an assembly plant in suburban Louisville. New building and equipment will cost approximately $650,000 and will be completed late in 1960.

West Monroe, La.—Olin Mathieson Chemical Corp., Mathieson Building, Baltimore, Maryland, plans a two-year expansion of facilities here to broaden company's line of packaging products. Included in the expansion, to cost approximately $12 million, is a semi-chemical pulping system, and other improvements ranging from lumber operations to packaging equipment.

Norwood, Mass.—Raytheon Manufacturing Co., Foundry Ave., Waltham, Mass., plans to construct a manufacturing facility. Company produces television and radio parts as well as electronic components and will use plant when completed in 1961 to augment production of company products. Plant will be erected at a cost in excess of $1 million by Thomas O'Connor & Co., Inc., 238 Main St., Cambridge, Mass., who has been awarded the construction contract. Cabot, Cabot, and Forbes Co., 460 State St., Boston Mass., will act as engineers.

Dearborn, Mich.—Ford Motor Company, American Road, this city, plans to install a new roll-down type tube reheating furnace and battery of coke ovens and soaking pits at company's River Rouge plant. Work will be done under the supervision of Salem-Brosius, Inc., 12 Arch St., Carnegie, Pa., at a cost reported to be about $35 million. Work will get under way at once for completion by late 1962.

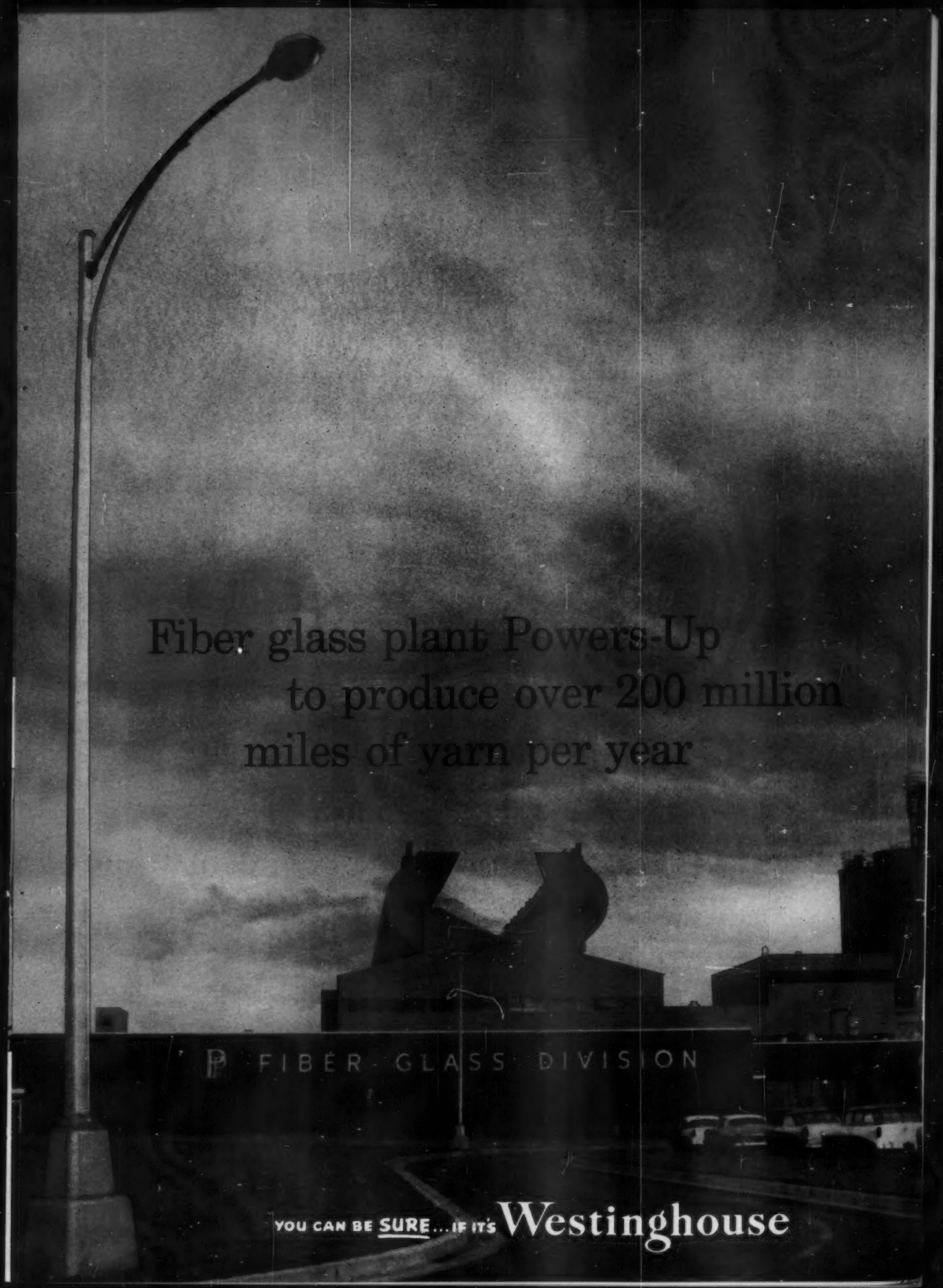
Detroit, Mich.—Aurora Gasoline Company, 15911 Wyoming Street, plans to construct a naphtha unifining unit at local refinery here. Work on the facility will get under way soon for completion sometime in 1962. Plant, a multi-million dollar project, will be designed and constructed by Refinery Engineering Co., 108 N. Trenton St., Tulsa, Okla.

Waseca, Minn.—E. F. Johnson Co., 520 Second Ave., S. W., this city, plans to construct a 90,000-sq ft addition to company's present manufacturing facilities located here. Expansion, to cost approximately $1 million, will double plant's production capacity and will also consolidate activities at other Waseca locations. Work already under way will be completed late next year.

Missoula, Mont.—Vancouver Plywood Co., Foot of 11th Street, Vancouver, Wash., will start construction on a $2.5-million plywood plant here. Land leveling has already begun and plant is scheduled to go into production by the summer of next year. Plant will produce primarily ponderosa pine and larch plywood with the balance in Douglas fir, spruce and white pine.

Burlington, N. J.—Hercules Powder Co., Inc., 917 Market St., Wilmington, Del., plans to triple capacity of its Burlington operations here, for the production of dimethyl terephthalate—a raw material for synthetic fibres,

(Continued on page 206)


Fiber glass plant Powers-Up
to produce over 200 million
miles of yarn per year
FIBER GLASS DIVISION
YOU CAN BE SURE... IF IT'S Westinghouse

Westinghouse coordinated system—engineered for today's production and tomorrow's expansion

A constant supply of electrical power, on a 24 hour a day basis, is a must in maintaining the continuous production of glass yarn. Pittsburgh Plate Glass Company, in planning for the new Fiber Glass Division plant in Shelby, North Carolina, made certain that an adequate, uninterrupted supply of power would be available for present production schedules and future expanded schedules.

A sectionalized electrical loop system was specified to provide for duplicate feed from the 15 kv main substation to each power center. This insures the constant service needed for the continuous glass process line.

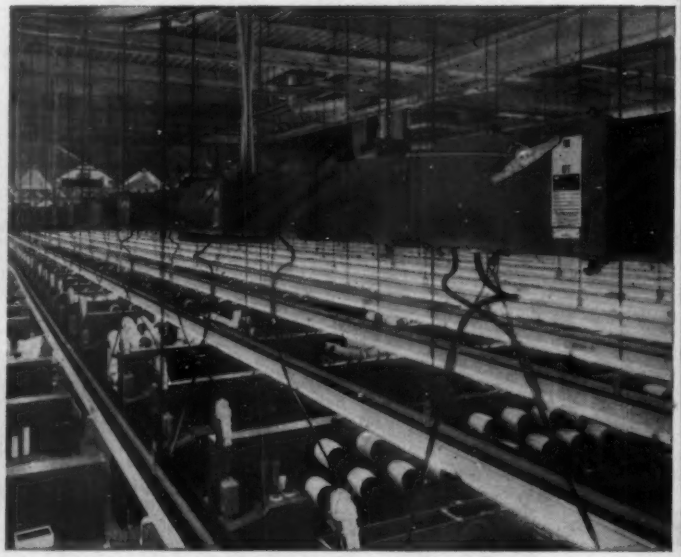
Specification of Westinghouse equipment provided the important advantages of (1) a single order source, (2) the facility with which components combine in installation, (3) provisions for future expansion made in the equipment being installed and (4) the ease with which additional Westinghouse equipment can be added when required. A 50% expansion program is already in progress, because of the increased public acceptance of this high quality fiber glass yarn. (*cont'd.*)

YOU CAN BE SURE...IF IT'S

Westinghouse

COVER PHOTO: Exterior view of Fiber Glass Division plant of the Pittsburgh Plate Glass Company, Shelby, North Carolina. Shown in foreground is one of 33 Westinghouse OV-20 mercury luminaires located in the driveway and parking areas.

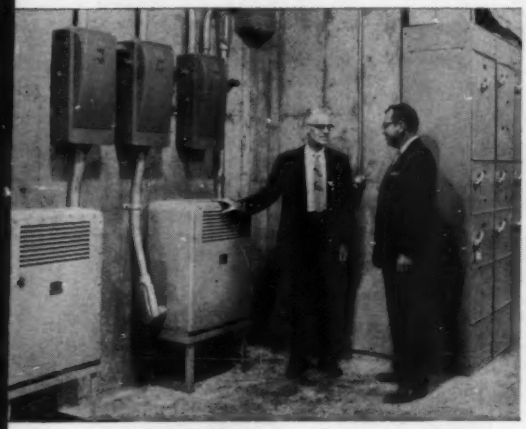
Examining plant plans are: C. Y. House, Westinghouse Construction Specialist; J. A. Gillespie, Representative, Lockwood Greene Engineers, Inc., Architect-Engineers, Spartanburg, S. C.; J. R. Miller, Westinghouse Construction Sales Engineer; R. T. Ariail, Branch Manager, WESCO—Greenville, S. C.; G. H. Hollis, Ass't. Plant Engineer, Fiber Glass Division, Pittsburgh Plate Glass Co.; W. P. Dearman, Davis Mechanical Contractors, Inc., Electrical Contractor; W. A. Brunnick, Plant Engineer, Fiber Glass Division, Pittsburgh Plate Glass Co., Shelby, N. C.



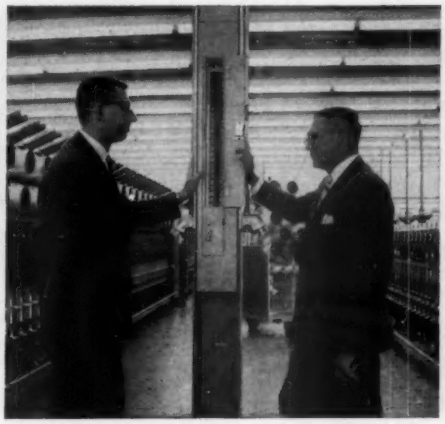
Westinghouse 600 amp plug-in bus duct in spinning room. Fusible plug-in units supply a power take-off point wherever required for the spinning machines and also provide protection and control for the circuits. J-94135-2

W. A. Brunnick, J. A. Gillespie and W. P. Dearman in front of Westinghouse 3000 kva double ended dry-type ASL power center (each transformer rated 1500 kva). The section of Westinghouse low voltage switchgear shown at left contains draw-out type DB-25 air circuit breakers which have been added after the initial installation. Air blast equipment installed on transformers increased capacity to allow for this expansion. Westinghouse Class 11-350 motor control center of new design is shown at right.

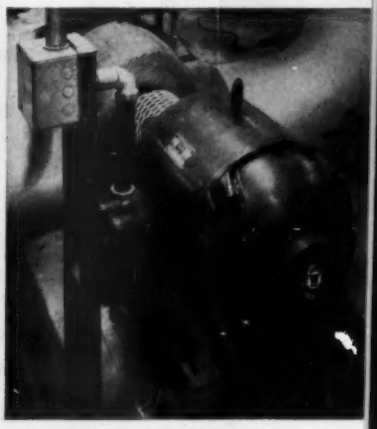
J-94135-3



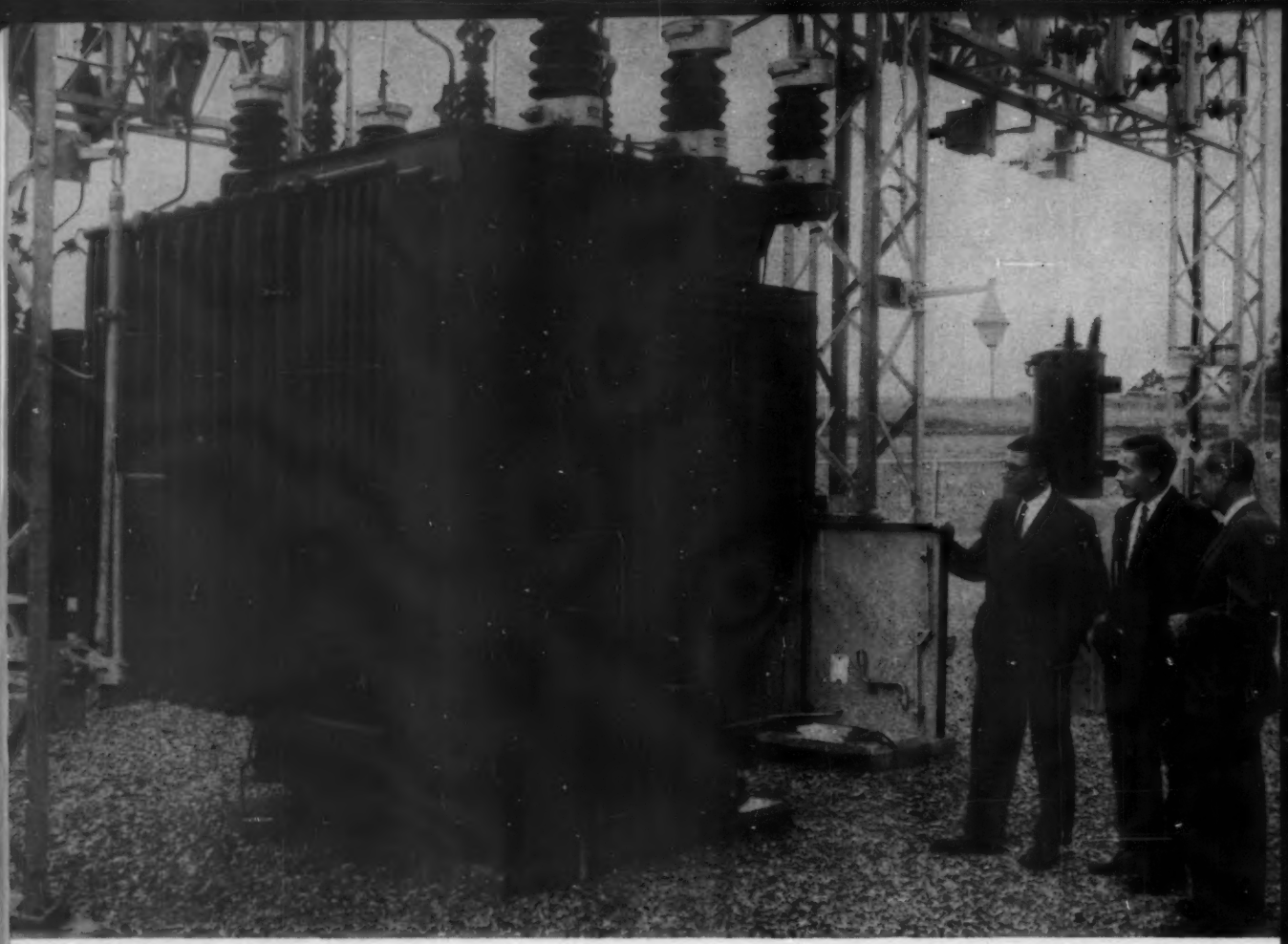
G. H. Hollis and J. W. Rigdon, Westinghouse Industrial Sales Engineer, are shown with two of the many Westinghouse 45 kva DT-3 dry-type transformers used to step down system voltage to 208y/120. Wall mounted safety switches shown above transformers are all of the fusible type rated 200 amp. At right is Class 11-350 motor control center which combines all equipment room motor control into one centralized structure. Modular design assures interchangeability of starter units.



Westinghouse NLAB column type panelboard with wiring trough and pull box is examined by J. A. Gillespie and C. Y. House. The quick-lag breakers in this panelboard offer protection against overloads and short circuits for the lighting and receptacle circuits.



Westinghouse type 50 hp Life-Line® CSP induction motor driving the chilled water pump in the refrigeration system.



J. A. Gillespie, J. R. Miller and W. P. Dearman inspecting Magamp control panel of Westinghouse 1000 kva URS step type voltage regulator in the main substation. Westinghouse station type feeder voltage regulators will maintain the correct voltage automatically regardless of load conditions. Full power is always available to all motors and machines insuring operation at their highest efficiency.

Westinghouse system for today's production and tomorrow's expansion *(cont'd.)*

Powering-Up electrically for present needs and providing for anticipated future expansion can mean important benefits and savings in any industrial plant construction. For information about what such benefits and savings can mean to you, call the Westinghouse distribution outlet nearest you, or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pennsylvania.

J-94135-4

OWNER: Pittsburgh Plate Glass Co., Pittsburgh, Pa.

ARCHITECT-ENGINEER: Lockwood Greene Engineers, Inc., New York, N.Y.

GENERAL CONTRACTOR: Daniel Construction Co., Greenville, S.C.

ELECTRICAL CONTRACTOR: Davis Mechanical Contractors, Inc., Greenville, S.C.

ELECTRICAL DISTRIBUTOR: Westinghouse Electric Supply Co., Greenville, S.C.

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV FRIDAYS

For more facts circle 564 on Reply Card

Close-up view of finished glass yarn ready for packing and shipment. Each of these spools averages 45,000 yards of yarn for use by the textile industries.

Hats off to the profit makers!

Maintenance departments are major profit makers. Here's why:

A 10% reduction in maintenance costs can result in a *4% jump in profits in the average plant*—according to latest Commerce Department figures.

Increasing numbers of cost-conscious maintenance men are adopting Organized Lubrication as one of the proven ways to reduce costs. As Texaco Lubrication Engineers have demonstrated time and again, an Organized Lubrication program can *cut direct maintenance costs as much as 10%!* (Other benefits: more dependable production, reduced lube inventory, simplified purchasing.)

Managers throughout the U.S. who have installed and evaluated Organized Lubrication programs can testify to the profit gained.

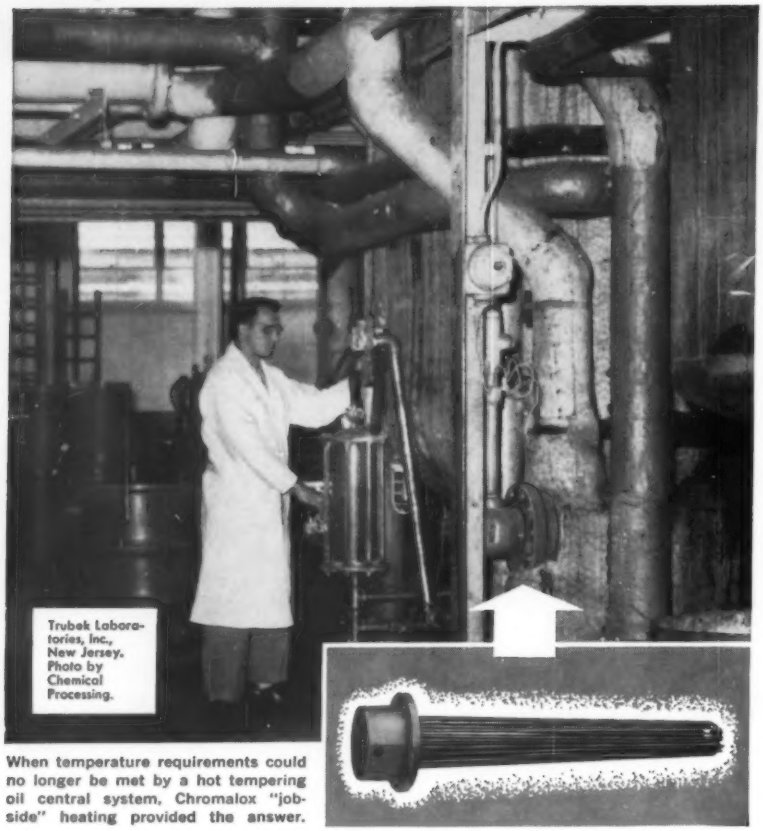
Texaco Lubrication Engineers can offer help and helpful material to start an Organized Lubrication program in your plant. Why don't you look into it? Call our expert—or write for a copy of our book: "Organized Lubrication . . . Major Cost Control Factor."

☆ ☆ ☆

Texaco Inc., 135 East 42nd Street, New York 17, N. Y., Dept. E-131.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

Call your Chromalox Man for answers to . . .



When temperature requirements could no longer be met by a hot tempering oil central system, Chromalox "job-side" heating provided the answer.

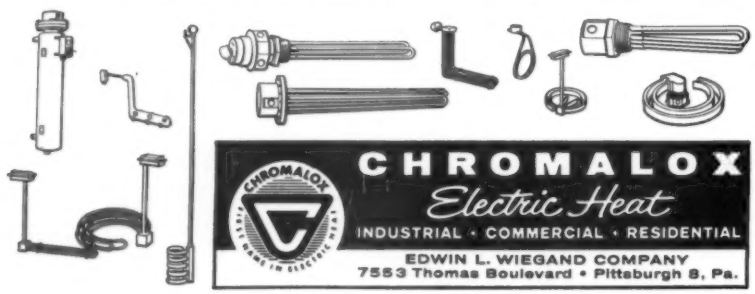
Widely different temperature requirements on various processing vessels

Recently, this New Jersey company converted an old hot oil central system to Chromalox electric "job-side" heating. In addition to being troublesome, the old system could not provide the variety of temperatures required for their growing diversity of products. Switching to Chromalox Immersion Heaters, they now use Aroclors and Dowtherm as heat transfer media. On one 350-gallon vacuum still, 18kw of heat capacity now provides temperatures of 290°C. Chromalox Type TMO Immersion Heaters operate in the bottom of the vented vessel jacket which contains the heat transfer medium. Using 30kw, a 450-gallon sealed jacket reactor can attain 325°C, using Dowtherm-A.

Since some vessels had previously been equipped with steam coils or were glass-lined, insertion of heaters into the vessel or jacket was impractical. Instead, transfer media is heated adjacent to the vessel and circulated by sump-type centrifugal pump.

Perhaps your Chromalox Man, listed at the right, can help you solve some of *your* heating problems the easy, economical, *electrical* way. Why not give him a call for . . . *Faster heating* of water, oils, Dowtherm, Prestone. *Faster melting* of grease, asphalt, solder, babbitt. *Faster superheating* of steam, compressed air. 7784

CHROMALOX has a complete line of electric heaters to meet all your liquid processing requirements:



CHROMALOX
Electric Heat
INDUSTRIAL • COMMERCIAL • RESIDENTIAL
EDWIN L. WIEGAND COMPANY
7553 Thomas Boulevard • Pittsburgh 8, Pa.

Call Chromalox for the man with the Electrical Answers to your heating problems

ATLANTA 9, GA.
Applebee-Church, Inc.
1389 Peachtree St., N.E.
Trinity 5-7244

BALA-CYNWYD, PA.
J. V. Calhoun Company
349 Montgomery Ave.
Mohawk 4-6113
Greenwood 3-4477

BALTIMORE 18, MD.
Paul V. Renoff Company
333 East 25th St.
Hopkins 7-3280

BINGHAMTON, N. Y.
R. P. Smith Co., Inc.
94 Henry St.
Phone 4-7703

BLOOMFIELD, N. J.
R. L. Faber & Assoc., Inc.
1246 Broad St.
Edison 8-6900
New York: Worth 4-2990

BOSTON 11, MASS.
Leo C. Pelkus & Co., Inc.
683 Atlantic Ave.
Liberty 2-1941

BUFFALO 2, N. Y.
Niagara Electric Sales Co.
505 Delaware Ave.
Summer 4000

CHARLOTTE 2, N. C.
Ranson, Wallace & Co.
116½ E. Fourth St.
Edison 4-4244
Franklin 5-1044

CHICAGO 5, ILL.
Fred I. Tourtelot Company
407 S. Dearborn St.
Harrison 7-5464

CINCINNATI 3, OHIO
The Smysor Company
1046 Delta Ave.
Trinity 1-0605

CLEARWATER, FLA.
J. J. Galleher
617-A Cleveland St.
P. O. Box 1376
Phone 3-7706

CLEVELAND 13, OHIO
Anderson-Bolds, Inc.
2012 W. 25th St.
Prospect 1-7112

DALLAS 26, TEX.
L. R. Ward Company
3009 Canton St.
Riverside 1-9004

DAVENPORT, IOWA
Volco Company
215 Kahl Building
Phone: 6-5233

DENVER 2, COLO.
E. & M. Equipment Co.
2415 Fifteenth St.
Glendale 5-3651
Genesee 3-0821

DES MOINES 14, IOWA
Midwest Equipment Co. of Iowa
842 Fifth Ave.
Cherry 3-1203

DETROIT 38, MICH.
Carman Adams, Inc.
15760 James Couzens Hy.
University 3-9100

HOUSTON 3, TEX.
L. R. Ward Company
3605 Polk Ave.
Capitol 5-0356

INDIANAPOLIS 8, IND.
Couchman-Conant, Inc.
1400 N. Illinois St.
Station A, P. O. Box 88023
Melrose 5-5313

KANSAS CITY 6, MO.
Fraser D. Moore Co.
106 E. 14th St.
Victor 2-3306

LOS ANGELES 15, CAL.
Montgomery Brothers
1053 S. Olive St.
Richmond 7-9401

MIDDLETOWN, CONN.
Dittman and Greer, Inc.
33 Pleasant St.
Diamond 6-9606

MILWAUKEE 3, WIS.
Gordon Hatch Co., Inc.
531 W. Wisconsin Ave.
Broadway 1-3021

MINNEAPOLIS 4, MINN.
Volco Company
831 S. Sixth St.
Federal 6-6631

NASHVILLE 4, TENN.
H. R. Miles and Associates
2500-B Franklin Rd.
Cypress 2-7016

NEW YORK CITY, N. Y.
See "Bloomfield, N. J."

OMAHA 2, NEB.
Midwest Equipment Co.
1614 Izard St.
Atlantic 7600

PHILADELPHIA, PA.
See "Bala-Cynwyd, Pa."

PITTSBURGH 6, PA.
Woessner-McKnight Co.
1310 Highland Building
115 S. Highland Ave.
Emerson 1-2900

PORTLAND 9, ORE.
Montgomery Brothers
1632 N.W. Johnson St.
Capitol 3-4197

RICHMOND 26, VA.
O. M. Thompson
Westhampton Station
P. O. Box 8762
Atlantic 8-8758

ROCHESTER 4, N. Y.
Niagara Electric Sales Co.
133 Clinton Ave. S.
Hamilton 6-2070

ST. LOUIS 1, MO.
C. B. Fall Company
317 N. 11th St.
Suite 1001
Chestnut 1-2433

SAN FRANCISCO 3, CALIF.
Montgomery Brothers
1122 Howard St.
Underhill 1-3527

SEATTLE 4, WASH.
Montgomery Brothers
911 Western Ave.
Main 4-7297

SYRACUSE 6, N. Y.
R. P. Smith Co., Inc.
2507 James St.
Howard 3-2748

WICHITA, KAN.
Fraser D. Moore Co.
695 Geo. Washington Blvd.
Amherst 2-5647

For more facts circle 566 on Reply Card

Handling Hot Fumes? Bifurcate 'em!

A protective housing shields a DEBOTHEZAT Bifurcator® motor from contact with hot and corrosive fumes. Special alloys for housings and fan wheels are available for extremely corrosive fumes. The result: smoother operation and lowered motor maintenance costs. In-the-duct installation of DEBOTHEZAT Bifurcator Fans saves valuable space and ends sharp-corner deflection of exhaust flow. Friction is reduced and velocity increased.

Direct-drive DEBOTHEZAT Bifurcator Fans economize fume removal problems in a wide variety of applications. Contact a DEBOTHEZAT engineer NOW.

De Bothezat® FANS

A DIVISION OF

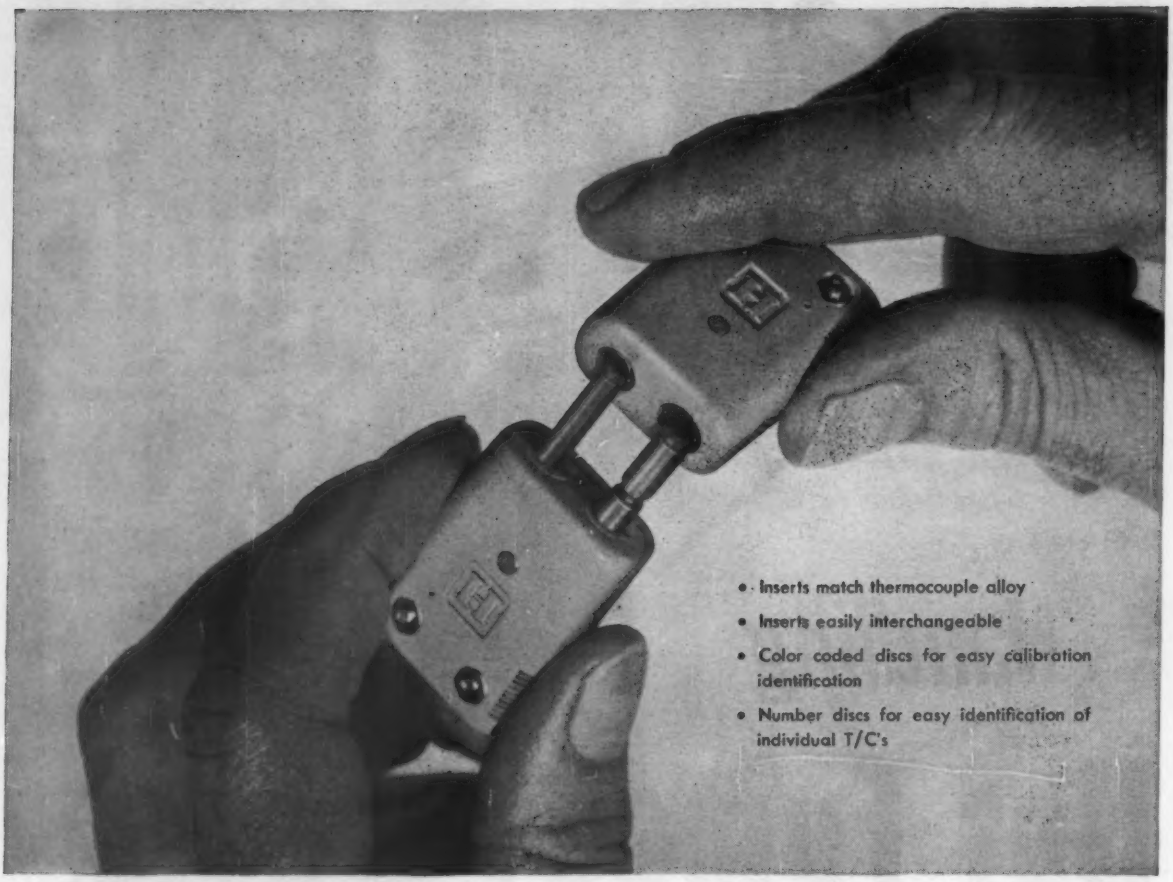
American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

FOR FURTHER INFORMATION
LET OUR CATALOG IN
SWEET'S
PLANT ENGINEERING FILE
OR WRITE FOR COPY

IN CANADA: Represented by DOUGLAS ENGINEERING, LTD., Toronto • Montreal

For more facts circle 567 on Reply Card


• Inserts match thermocouple alloy
• Inserts easily interchangeable
• Color coded discs for easy calibration identification
• Number discs for easy identification of individual T/C's

NEW *QuiK-Konnect** thermocouple components

For accurate, swift, and foolproof connection of thermocouples to extension wire

New *QuiK-Konnect* plug and jack bodies give fast, easy, and foolproof extension wire connections in plant, laboratory or test cell installations.

Inserts have different diameter positive and negative poles, for foolproof connection . . . are extremely easy to remove for field calibration change or replacement. Various tube adapters are available to protect small-diameter thermocouples, and cable clamps can be supplied to protect extension wires from fraying or tearing.

The *QuiK-Konnect* line, in addition to plugs and jacks, includes:

1. Single-jack panel that fits ¾-in. knockout.
2. 4-point jack panel that fits standard electrical outlet box.
3. Multiple jack strips.
4. Custom-built multiple jack panels.
5. *QuiK-Kords** for patch programming multiple jack panels.

You can get complete details from your nearby Honeywell field engineer. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, 21 Penn St., Fall River, Mass.

*Trademarks

Honeywell

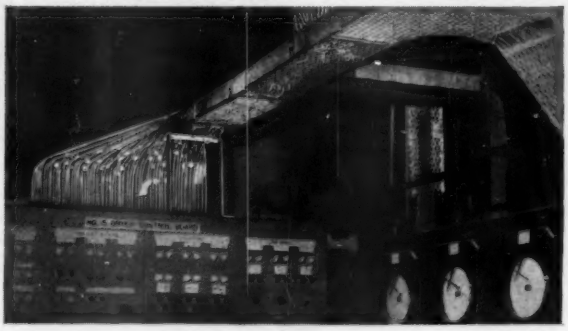
H HONEYWELL *First in Control*

Mineral Insulated (MI) Cable for hazardous areas

Compact • easily installed • economical • fireproof • no vapor passage throughout the cable run • perfect for instrumentation.

This 600 volt complete wiring system is unique not only in its construction but in its variety of applications. Composed of from 1 to 7 copper conductors, refractory mineral insulation, and encased in a seamless gas and water-tight copper tube, the system is UL listed for hazardous areas. The solid construction of MI cable and simply applied fittings utilizing a standard pipe thread, eliminate seal-off fittings of the conduit type. The completely inorganic construction of General Cable's MI allows for continuous operation at 250°C.

Ask any General Cable Authorized Distributor or your General Cable Representative—at any one of the 65 General Cable offices coast-to-coast—to pinpoint actual installations of Type MI. For a free copy of the new 12-page Type MI Catalog, just write Dept. **PE-12.** General Cable Corporation, 730 Third Avenue, New York 17, N. Y. Offices and Distributing Centers Coast-to-Coast.

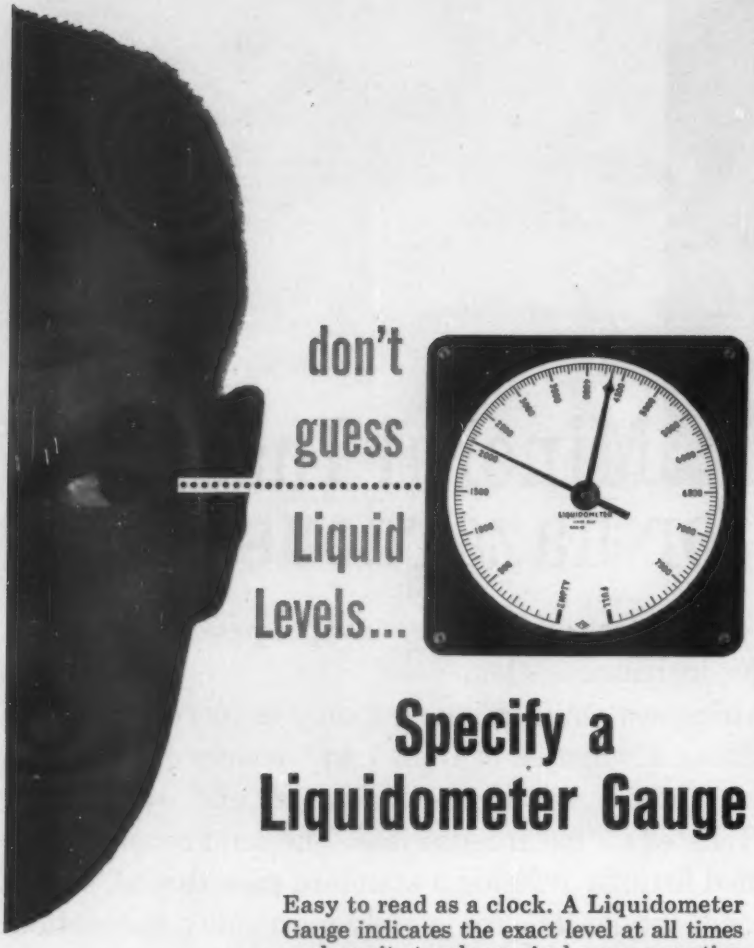


MI, shown here supported on trays, supplies the power to all motors and other control points for the drying ovens at a large petrochemical plant.

General Cable Corporation

Manufacturers of MI cable since 1946 • Mineral Insulated Wire Division

For more facts circle 569 on Reply Card



don't guess Liquid Levels...

Specify a Liquidometer Gauge

Easy to read as a clock. A Liquidometer Gauge indicates the exact level at all times ... shows it at a glance. And gauge operation is completely automatic – as far as 250 feet from the tank – without need for auxiliary power of any kind.

A Liquidometer Tank Gauge measures virtually any liquid. It's simple to install – requires no maintenance. Many have provided over 30 years of efficient, dependable service. All are approved by Underwriters' Laboratories and Factory Mutual.

Whether your gauging needs require an automatic Liquidometer Gauge, a hydrostatic Levelometer or a tank-site-indicating Direct Reader, you'll get the best by specifying Liquidometer. For complete details write Dept. B.

Since 1920 --of proven quality

THE LIQUIDOMETER CORP.

LONG ISLAND CITY 1, NEW YORK

For more facts circle 570 on Reply Card

This Is *Your* Advertisement!

REMEMBER OUR recent editorial quoting industry leaders on the function and importance of plant engineers? The response was tremendous. To date we've received hundreds of requests for reprints. And many of these requests came from industry leaders and marketing people.

With proven interest like this, we're convinced we should carry the story of the plant engineer to the public at large!

So beginning with the advertisement on the facing page we're going to run a series of messages in the *New Yorker* magazine.

Each ad will feature a quotation from an industry leader. Each will stress the importance of plant engineers to industry today.

The *New Yorker's* circulation of more than 400,000 includes many important people in industry, finance and marketing. Quite a few college students, too. (Tomorrow's plant engineers). An ideal audience from every standpoint!

We have been fortunate in obtaining the services of Noel Martin, one of America's leading graphic designers to do the series. We believe his striking designs will do much to dramatize the quotations.

If you would like a 17 in. x 22 in. poster-size reproduction of this advertisement for your office or den, just drop us a line. We'll be happy to forward you one free of charge by return mail. Send your requests to the Editor, Plant Engineering, 308 E. James St., Barrington, Ill.

PLANT ENGINEERING magazine dedicates this series to its readers, the thousands of plant engineers who plan, purchase and maintain America's industrial plants and the equipment and supplies they use.

"The Plant Engineer is at the source of our problems, conceives the solutions and directs the intricate steps of execution."

Charles H. Williams
Administrative Vice President – Engineering
United States Steel Corporation

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 215-216.

1—WATER COOLERS with self-contained cooling unit

"Packaged Cooling," incorporated in Sunroc Advanced Coolers, Wall-Hung Coolers (shown) and Remote Coolers, refers to the separate inside cabinet housing the entire refrigeration system. Only 12-9/16 by 20 in., this

compact inner cabinet is a self-contained unit permitting more convenient installation and easily removable for factory service or replacement. Major service is thus accomplished without removing the entire cooler or dismantling the cabinet. The cooling unit is designed to provide instantaneous cooling of fresh water drawn through seamless copper coils with reserve capacity for peak requirements. Because of this and other design features these coolers can be guaranteed for twice as long as many coolers, manufacturer states. Sunroc Corp.

2—SELF STORING HOSE for compressed air lines

Synflex Self-Storing Air Hose, for use with portable air tools and hoists, requires no storage facilities and has the additional advantages of lightness, resistance to kinking and ability to absorb twist, according to manufacturer. This hose is supplied coiled with reusable fittings and a spring guard to prevent crimping. Made of a flexible polyamide formulation, the hose has nylon's inherent imperviousness to oils, dimensional and chemical stability and toughness. It is designed for

pressures to 200 psi. Maximum working length is about 20 ft; coiled length, under 1 ft. Synflex Products Div., Samuel Moore & Co.

3—ODOR FILTER, disposable, activated carbon type

This filter is designed to combine high-efficiency odor removal with a high degree of air cleaning in one low-cost, disposable unit. An activated carbon adsorption filter, it can be used in almost any situation where contaminants in vapor form should be removed from an enclosed space, manufacturer points out, and it requires no reactivation. These filters are sealed in vapor-proof cartons to protect against odor absorption while in shipment or storage. They come in four standard sizes to fit in standard 2-in. frames. Bulletin 220 gives details. American Air Filter Co., Inc.

4—PIPE COVERING of expanded polystyrene

Pipe covering of Uni-Crest expanded polystyrene, is claimed to stop heat gain and prevent condensation and dripping. It has a low K factor, is odorless and non-toxic, resists moisture and has a compression strength of 16-20 psi, company announces, thereby permitting use of outside hangers without preparation. Suggested uses of the economically applied covering include such fields as food processing plants, breweries, refineries and chemical plants. Uni-Crest Pipe Covering comes in three standard sizes in regular or self-extinguishing types for temperatures lower than 150 F: light duty, nominal 1 in., for temperatures above freezing; medium duty, nominal 1½ in., for 32 F, and heavy duty, nominal 2 in., for 0 to —30 F. Extra heavy thicknesses are available. When required, paper and foil laminate jackets can be factory applied. United Cork Companies.

5—SPRAY GUN applies high melting point coatings

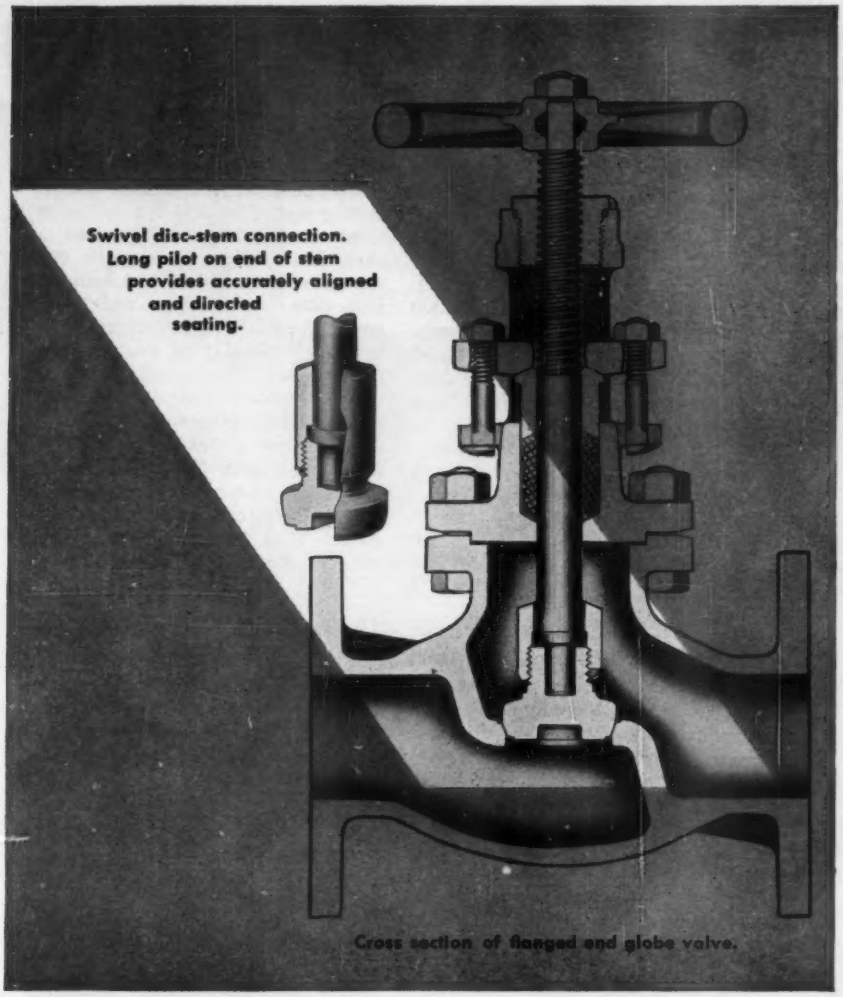
The Plasma Flame Spray Gun, utilizing the plasma-arc principle, develops normal work temperatures of 10,000 to 15,000 F, it is announced. The gun is designed for push-button operation in user's own plant, to spray any material that will melt without decompos-

ing—such as zirconium carbide, tungsten and tungsten carbide, zirconium boride and zirconium oxide, niobium carbide and others. Operating on inexpensive gases such as nitrogen and hydrogen, cost of generating the heat is substantially reduced over other methods. Other advantages claimed are easily controlled coating densities, reduced porosity, improved bond and tensile strengths. Training of operating personnel is said to be simple. Metallizing Engineering Co., Inc.

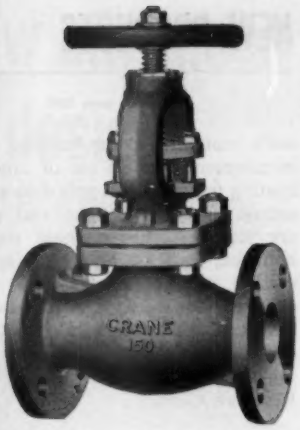
6—RESIN COATING adds new life to shingles

Reroofing without reshingling is said to be offered by Del-Coat, a polyurethane "liquid resin". Old shingles are merely coated with it, then sprinkled with ordinary sand. This treatment is claimed to seal and revitalize worn-out asphalt shingles, protecting them against wind and weather for many years, and to straighten weatherbeaten wooden shingles.

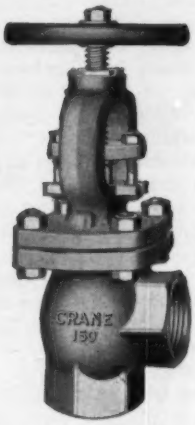
Del-Coat is based on a diisocyanate. Combined with either a polyethylene or polypropylene copolymer, the polyurethane formulation offers a high degree of abrasion resistance and flexibility, manufacturer states. Application is easy—the formulation is brushed, sprayed or rolled onto the shingled roof, followed by a layer of sifted sand, with this procedure repeated for best results. Company says that on completion, the roof is watertight again, and it also reflects the



Cross section of flanged end globe valve.



No. 18811 globe, ½"-6", flanged ends; ½"-2", screwed ends.



No. 18812 angle. ½"-2", screwed ends; ½"- 6", flanged ends.

How this swivel disc saves seating surfaces in Crane 18-8 SMo Globes

Even on toughest corrosive fluids, you will find these valves seating tight long after others have leaked.

The seats last longer because the Crane free swivel disc-stem connection prevents seizing and galling on the seats. The disc stops turning on contact with body seat ring, and the stem takes over all the closing torque.

Minimum clearance in disc-stem assembly prevents vibration and chatter, and the long pilot end of stem guides the disc squarely to seat.

Another feature of this disc—its modified plug type design combines the easier seating of a narrow ball-to-flat seat, and the greater resistance to erosion and scoring of a wide plug type disc. It's the ideal design for throttling.

Improved seating is but one of many refinements that make Crane 18-8 SMo globe and angle valves today's outstanding value in original cost as well as in maintenance savings.

For complete specifications and recommendations on applications for these all-stainless steel valves, consult your local Crane Representative . . . or write to address below.

CRANE® VALVES & FITTINGS

PIPE • PLUMBING • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Illinois—Branches and Wholesalers Serving All Areas

For more facts circle 572 on Reply Card

NEW PRODUCTS

(Begins on page 156)

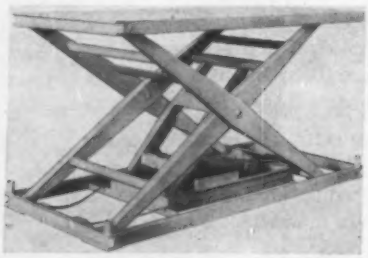
sun's heat to keep the building cooler in summer. Without use of sand, this coating may also be applied to various sidings. Savings in time and money are reported. Approximate cost announced, materials and labor, for processing asphalt shingles is 50 to 60 cents per square foot. A polyurethane treatment for wood shingles is reportedly less than half that of removing and replacing the shingles. Delka Research Corp.

7—SEALING NUTS to prevent pipe thread leaks

Pipe users—especially in the hydraulic, water and other processing industries—can now eliminate threaded joint leaks, it is announced, by installing the Tef-Seal nut together with usual fittings on all pipe connections. Manufacturer claims that Tef-Seal nuts eliminate leaks on all pipe threads—dry seal or standard. They may also serve as an economical substitute for straight thread O-ring boss fittings using original female pipe ports, company says, and give positive seal on directional fittings like tees and elbows without distorting mounting bosses or damaging valves and pumps. Available in nine sizes to fit pipe threads from ⅛ to 2 in. Bulletin 6170 gives details. The Weatherhead Co.

8—TABLE lifts long bulky or large light loads

The LP Series of scissor-type, hydraulic-powered lift tables are designed to simplify lifting, feeding and work-positioning of long loads for machine



process or assembly operations. Models range in capacity from 1000 to 6000 lb; platforms from 38- to 65-in. widths, 7- to 16-ft lengths; collapsed heights from 9½ to 12 in. Vertical platform travel is available up to 40 in., but where required, up to 60 in. can be provided. The tables are self-contained units with no superstructure. Southworth Machine Co.

9—COMPACT COMPUTER does complex calculations

Performance of more than 100,000 calculations a minute is announced for this small, transistorized computer. Requiring little more space than an average desk, the IBM 1620 Data Processing System operates under the direction of an internally stored program of instructions. It can perform engineering and scientific computations on a continuous basis.

The system consists of two modular units, a central processing unit and a paper tape reader and punch. It performs arithmetic and all logical input-output operations on a production basis. Conventional arithmetic is used, providing ease of communication between man and machine. No air conditioning equipment is required, permitting installation and operating cost to be kept to a minimum.

Advanced features incorporated include 20,000 digits of magnetic core storage with variable field length and immediate accessibility, and paper tape and electric typewriter input and output. Availability of two advanced programming systems and a library of mathematical and statistical routines simplifies programming. First of these systems are expected to be delivered late next year, at an anticipated cost under $75,000—or on a rental basis of around $1,600 a month. Data Processing Div., International Business Machines Corp.

10—CHEMICAL SOLVENT cleans electric motors, parts

Swish Elektrokleen is a chemical solvent which is said to completely clean electrical motors and parts of oil, grease, dust, dirt and other materials, and to "demoisturize" equipment which has been short-circuited by water. It utilizes a nozzle to provide a long-range, concentrated drenching spray to flush off undesirable foreign materials. Solvent will drain off and dry, or it may be wiped off with a cloth in easily accessible areas. It is described as non-combustible, non-toxic and non-corrosive. Montgomery Chemical Co.

11—QUARTZ LAMPS for baking, drying, dehydrating

Twenty times greater concentration of radiant energy than formerly possible is claimed for the T3 line of quartz infrared lamps. They are said to provide thousands of degrees of temperature almost instantly, yet be so resistant to thermal shock that ice water can be poured over a red hot lamp without cracking it. Another advantage is extreme compactness. The tube's small diameter permits mounting a number of lamps in a small space to achieve extreme concentration of radiant energy. According to company T3 Quartz Lamps produce the shortest infrared wavelengths of commercially available high wattage infrared sources to make them the most economical heat source for many infrared applications. Five lamps initially offered range from 500 to 1350 w in lengths from 5 to 10 in. Westinghouse Electric Corp.

12—HANDY TOOL makes aluminum soldering easier

Inexpensive and simple to operate, this tool is a long-handled holder for a glass-fiber brush insert. When rubbed through molten solder on the

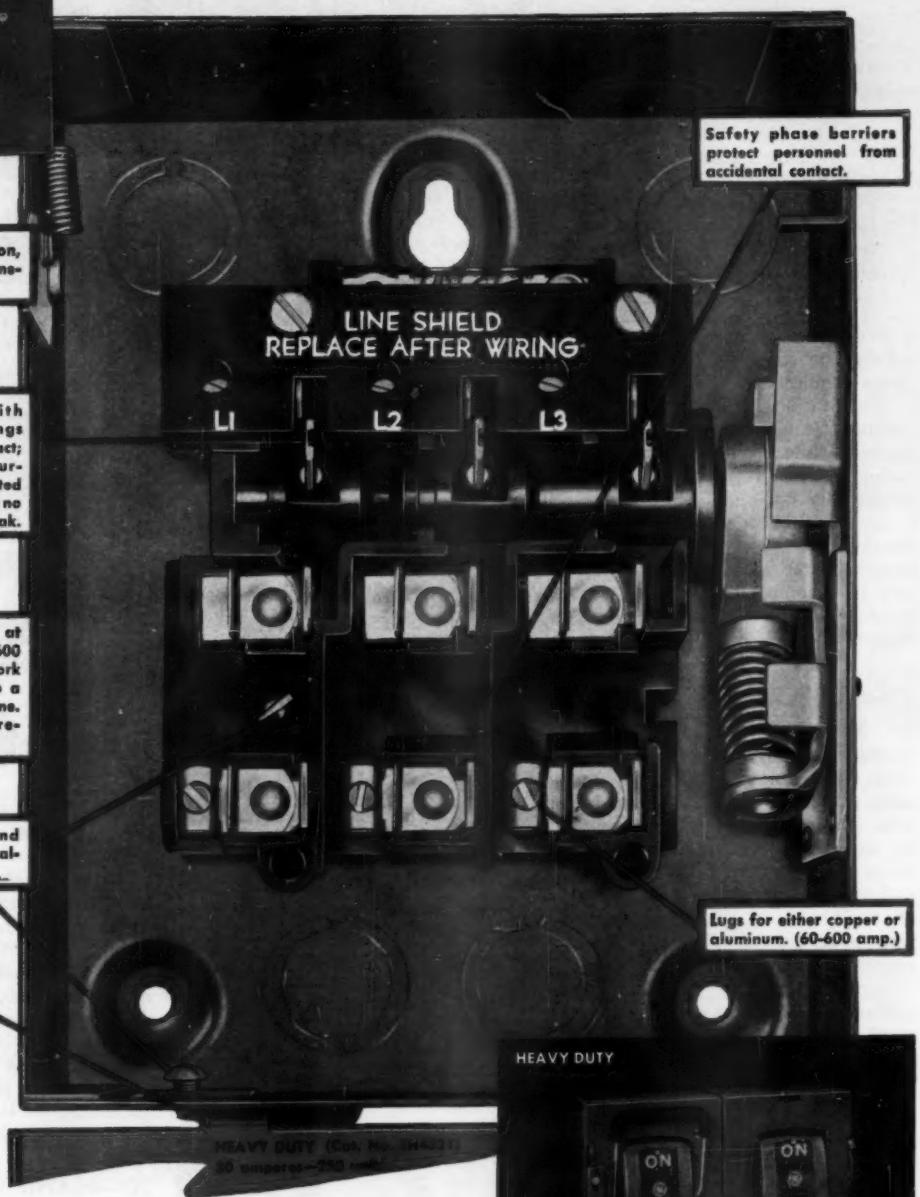
metal surfaces to be joined, the brush abrades the metal, removing oxide for a firm, smooth joint. Only additional equipment required is an ordinary torch, manufacturer states; tinning and fluxing operations aren't necessary. The tool is sold in kit form with solder rods, glass brush refills and instructions for use. Reynolds Metals Co.

13—RESURFACING for floors that take abuse

Vyniflex is claimed to possess perfect adhesion to any clean surface—even if it is damp—for feather-edge patching, grouting, repointing of tile or brick, or resurfacing. This corrosion-resistant material is designed for floors subject to acids, alkalies, salts, oils, fats, grease, water, slip hazards, trucking or abrasion, as found in bakeries, breweries, dairies, flour mills, pulp and paper mills, tanneries, waterworks, bottling plants, chemical plants, etc.

General Electric brings you bold new advances in safety switch design

New G-E light and heavy duty safety switches offer savings in space, easier installation, longer life and maximum safety. And the Heavy Duty (Type A) sells at Normal Duty (Type C) prices! Write for Bulletin CPD-74. General Electric Company, Circuit Protective Devices Dept., Plainville, Conn.



Safety phase barriers protect personnel from accidental contact.

Clear ON-OFF indication, permanent metal nameplate.

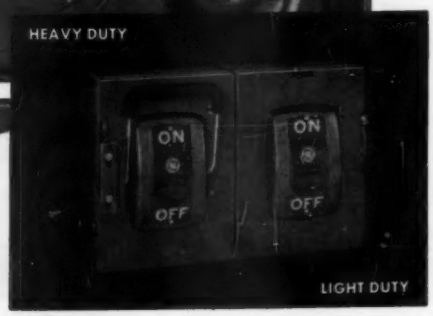
Visible blades with stainless steel springs assure positive contact; minimum joints in current path; silver-plated current-carrying parts; no fiber linkages to break.

Wire incoming lines at top or bottom. (100-600 amp.) Saves time, work and wire; lets you do a neater job in less time. ON-OFF indication remains unchanged.

Removable cover and interior for easier installation.

Bottom-hinged and front-operated for close ganging.

Lugs for either copper or aluminum. (60-600 amp.)



GENERAL ELECTRIC

For more facts circle 573 on Reply Card

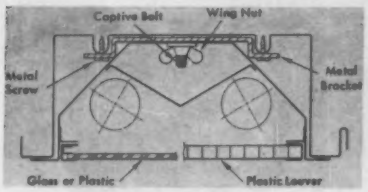
NEW PRODUCTS

(Begins on page 156)

Material is described as shock-proof, non-flammable, warm and quiet underfoot. It can be installed inside or out on concrete, wood, asphalt, metal, brick or composition. Flexrock Co.

14—LIGHTING FIXTURE for flush installation

Greatly simplified for flush installation, this lighting fixture assembly is suggested for installations calling for standard roll-formed steel roof decks



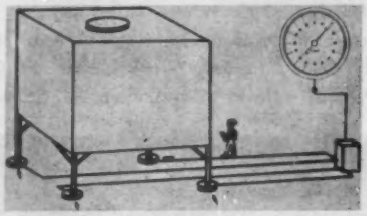
in spans up to 30 ft or more, without intermediate supports. As shown, the fixture requires no adapting devices, or modification of the deck for installation. It is of 20-gage steel, finished in white enamel. Its frame includes a piano-type hinge, and is fastened by one-quarter-turn latches. It comes in 48, 72- and 96-in. lengths, Slimline and 40-w rapid start, and accommodates glass or plastic louvers, or a combination of both types. Building Products Div., The R. C. Mahon Co.

15—RUBBER HOSE reinforced with rigid vinyl coil

Rubber hose reinforced with rigid Geon vinyl is announced for use where dusts and gases create explosion hazards. Designed to overcome sparking and explosion hazards which occur when rubber exterior wears through and wire is exposed, the hose consists of a rubber core which is wrapped with a continuous coil of 3/16-in. round, rigid vinyl rod for added strength and rigidity. Both core and coil are then wrapped with an exterior layer of abrasion resistant rubber. The rigid vinyl rod is made from Geon vinyl resin produced by B. F. Goodrich Chemical Co. Lawrence Hose Co.

16—WEIGHING SYSTEM offers installation economy

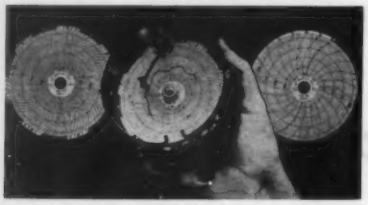
Contents of bins, tanks, truck tanks, conveyor loads and anything that can be weighted on platform scales can be weighted on the Air-Mount Weighing System. It is available for loads



from 0-300 to 0-200,000 lb, and said to have a repeatable accuracy of better than 1/10 of 1 per cent. Installation costs are reportedly low, because changes in floor construction or foundations are not required. According to manufacturer, complete equipment and installation for a four-legged, 30,000-lb storage bin or equivalent can usually be obtained for less than half the cost of many scales, and installation time is ordinarily less than an hour. The system is operated by a small load-cell placed under each leg of tank (as shown) or platform. Linear pneumatic pressure, automatically controlled in each load-cell, produces a pneumatic signal on a meter. Weber Air-Weigh Co.

17—THERMOMETER records with a dry stylus

Model 585 is announced as a dry stylus recording thermometer that is low in cost, suitable as a portable field service unit, small enough to pack with goods being shipped, and designed to record in any position. For temporary or permanent mounting, it can be used in cold rooms, refrigerators, ovens, dairies, drying sheds, areas with controlled temperatures, etc. For recording temperatures of liquids or wet environments, this thermometer may be encased in a polystyrene bag. It uses a spring-wound clock movement, comes in 24-hr or seven-day time ranges; 20 to 220 F or —40 to 160 F. Encased in black anodized aluminum, the instrument weighs 14 oz, costs under $40.00. The Pacific Transducer Corp.



18—COUNTER shows six digits in compact case

This electromagnetic counter displays six digits in a case slightly more than 2 in. wide, and sells for approximately $8.00 in quantities. The wheels are white metal with black characters. Operation may be on standard 115 v a-c, or on other a-c or d-c voltages. Power consumption is about 6 w, and maximum constant speed rating is 700 counts per minute. Base mounting dimensions are same as those of company's five-figure model of this type. This new six-wheel counter, a non-reset type, is suggested for use wherever there is need for a low speed, limited life unit of minimum initial cost, yet having rugged reliability—as for tallying circuit breaker cycles in transformer banks. Veeder-Root Inc.

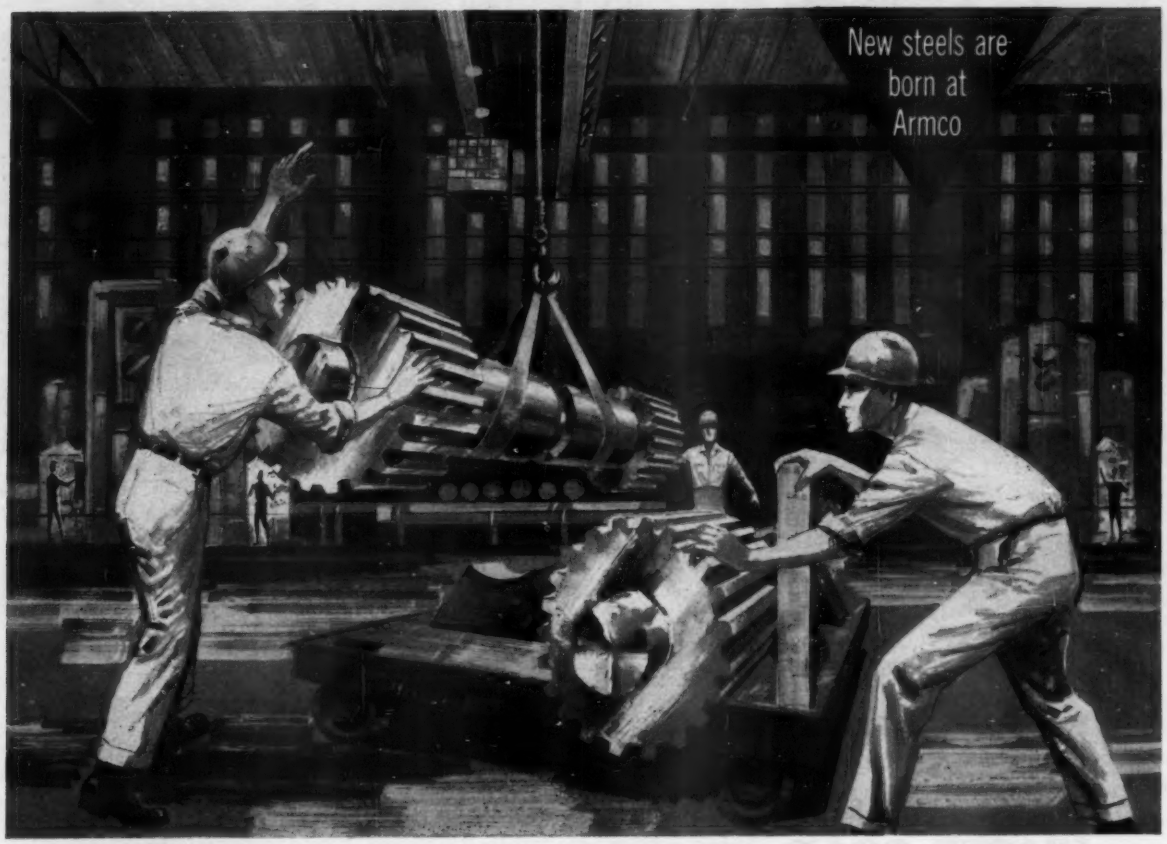
19—TORQUEMETER measures torques from several shafts

Up to five torque pickup heads are used with this torquemeter to measure torques of rotating shafts. Available with ranges covering torques from 0.1 oz-in. to 500 oz-in., the instruments are designed to provide accuracy to within ± 2 per cent of full scale.

Readings are independent of shaft speeds between 50- and 24,000-rpm; readings are also independent of the direction of shaft rotation. A one-knob calibration adjustment for each torque pickup head serves to provide stability against ambient changes. These torquemeters may be used with most recorders, says manufacturer and, where required special torque pickups may be installed so no loads are imposed on the system measured. Overall design is said to give overload protection up to twice the rated load. Metron Instrument Co.

20—HAND GRINDING TOOL has flexible shaft

This tool provides speeds of 500 to 3,500 rpm at the geared end and 3,000 to 15,000 rpm at the direct drive end of the 1/15 hp universal

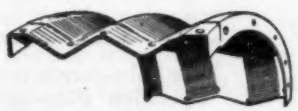


Production as usual, but...

20 FEET DOWN

they're putting in a new sewer

Installing sewers, conduits, and other underground structures by tunneling permits you to save the surface. Most of the work is underground—out of the way—and you maintain production and business as usual. What's the best way to tunnel? Armco Tunnel Liner Plates. Pound for pound they are the strongest made. Write for the Armco Liner Plate Catalog. Ask, too, about the Armco Construction Service that can provide Armco Liner Plate and other Armco Drainage Structures INSTALLED on a sub-contract basis. Armco Drainage & Metal Products, Inc., 7829 Curtis Street, Middletown, Ohio.



ARMCO DRAINAGE & METAL PRODUCTS

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company • The Armco International Corporation • Union Wire Rope Corporation

For more facts circle 574 on Reply Card

SURVEY DISCLOSES INDUSTRY'S NO. 3 SKIN HYGIENE PROBLEM: WASTE SOAP

Here's The Answer To It From SBS

The most difficult three industrial skin hygiene problems, as rated by 2,177 major plants recently surveyed, are:

1. *SKIN DISEASE*
2. *REMOVAL OF TOUGH SOILS*
3. *WASTE OF SOAPS*

Closely associated with the actual problem of skin disease is the costly waste of soaps in *all* plant areas. Liquid soaps run off hands too easily, other types melt or spill. Where wasted soap accumulates, extra housekeeping expenses are involved, sub-sanitary conditions exist and worker dissatisfaction mounts. Often the combined cost of soap waste and resulting maintenance can add up to more than the original cost of the soap supply. Small wonder industry rates it as such a problem!

What's the answer to it? Ask an SBS representative to show you "Operation Pinpoint", 10 minute sound slide digest of the national survey, and you'll see how a *planned corrective program* can solve all these skin hygiene problems. Since SBS produces a *complete range of cleansers*, he can suggest the right cleanser for each job. For the safest, savingest answer to skin disease, tough soils, and soap waste, write today . . . Dept. 3L.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N.J

CANADA: Chemical By-Products, Ltd., Toronto, Ontario

For more facts circle 575 on Reply Card

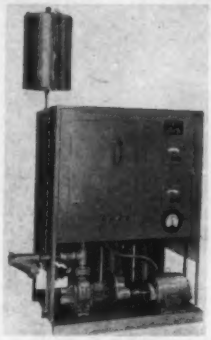
NEW PRODUCTS

(Begins on page 156)

type motor. Company claims accurate speed control through carbon pile, foot-operated rheostat; moisture, oil and grease resistant 36-in. long sheath; smooth, vibrationless flexible shaft operating through bronze liner. The metal handpiece weighs 6 oz and is 5 in. long, 1 in. in diameter, the front bearing is sealed against dirt and abrasives by "Nilos" rings. Unit is furnished with geared chuck of 0-⅛ in. capacity. The Dumore Co.

21—HEAT TRANSFER SYSTEM is automatic electric unit

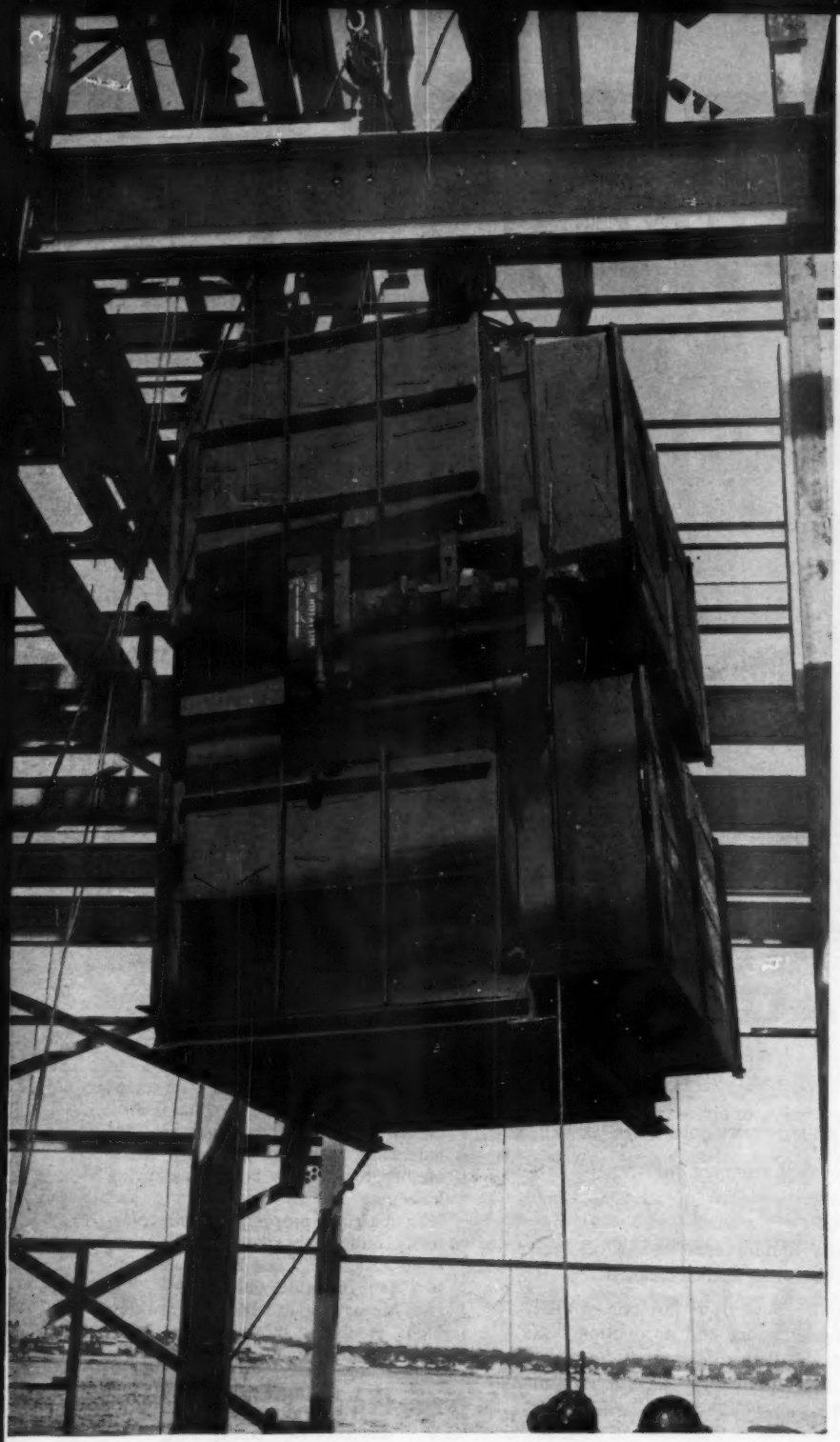
The electric Per-Fab Heat Transfer System is designed to provide liquid heat transfer for processes using jacketed kettles and lines, cored platens,



hollow rolls. The packaged unit is complete with automatic controls and safety devices, pre-wired and ready to hook up to the process. Units may be had for use with many types of heat transfer fluids in capacities from 4.5 to 80 kw for temperatures to 600 F. Available in standard (shown), and explosion-resistant construction, they may be modified to include cooling units if desired. Per-Fab Co., Inc.

22—DUST CONTROL UNIT uses sonic generators

In the Sonoclean, sonic generators of low audible frequency clean the glass filter bags by making them vibrate in an undulating motion, without flexing. For each dollar spent in installation, states manufacturer, the Sonoclean System is more efficient than other filters; it effectively cleans dry, hot gases, and eliminates use of extensive shaking mechanisms with supporting members. The new design is also reported successful in handling low temperature gases. Recent improvements in glass cloth filter design utilized in the Sonoclean are said to extend the low operating and



Complete and ready to run, Package Air Preheater is lowered through steelwork of new power station at Braintree, Mass. Installation at Braintree Electric Light Dept. uses largest available package preheater, with a diameter of approximately 12'. Fitted to a 130,000 lb per hr boiler, this Package Air Preheater will boost combustion air temperature by about 420°F with heat recovered from stack gas.

PACKAGE AIR PREHEATER

gives twofold economy at Braintree's new power station

PACKAGE DESIGN FACILITATES INSTALLATION; FUEL SAVINGS TO WRITE OFF COST IN 2 YEARS.

Braintree, Mass., has achieved an economic double-header with the Air Preheater in their new power station:

1. Initial saving: The Package Air Preheater, shown above, was delivered as a completely preassembled unit. All it needs is gas ducts and a power line and it's ready to work—installed at a fraction of the time and cost required for conventional units.

2. Long-term savings: Records prove that Braintree's Package Air Preheater can pay for itself—just on fuel savings alone—within two years.

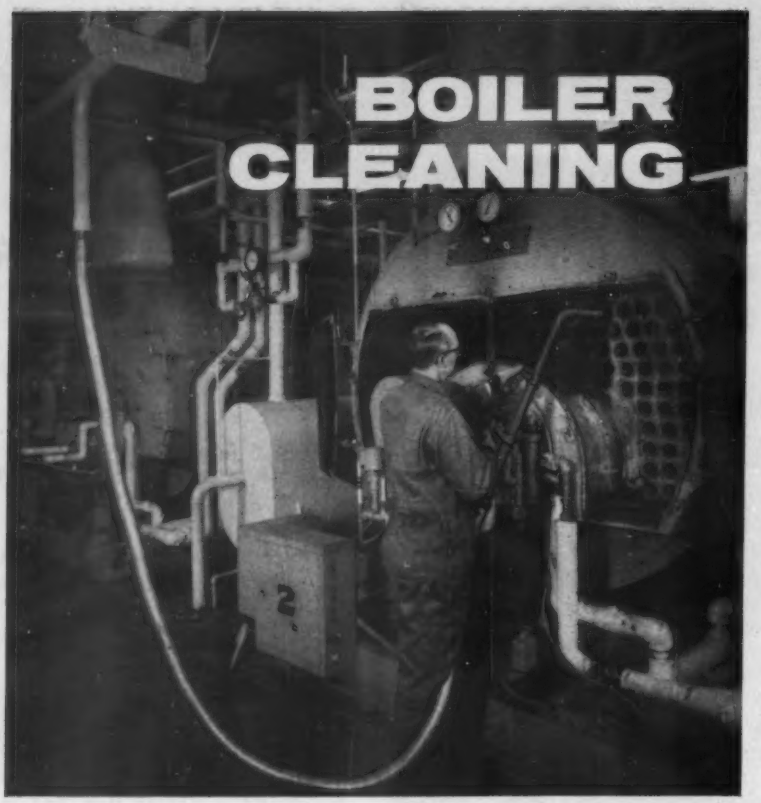
Package design gives you these advantages on boilers as small as 25,000 pounds of steam per hour —or as large as 250,000 lbs per hr. And a Package Air Preheater is one of the surest ways to reduce fuel consumption: you cut your fuel bill 1% with every 45-50°F increase in preheated air temperature.

Get all the facts. Write today for your copy of the free 14-page booklet describing the multiple savings you get with a Package Air Preheater.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

For more facts circle 576 on Reply Card



. . . one of many maintenance tasks

simplified by **SPENCER VACUUM**

Here's boiler cleaning that's *quick . . . clean . . . effective.* No time-consuming, backbreaking brushing. High velocity *air* does the work.

A Spencer vacuum cleaning system offers many advantages:

- Boilers can be cleaned HOT.
- Tubes are easily cleaned even in *cramped quarters.*
- Scale formation is reduced.
- Fuel savings are substantial.
- Requires an average of only 30 minutes.
- Bases of stacks and breechings can also be cleaned.

And boiler cleaning is just one of *many* plant maintenance and production tasks made easier with a Spencer vacuum system. Other applications include: routine cleaning . . . water pick-up . . . cleaning of small parts during inspection or assembly . . . reclaiming powders, grinding compound, etc.

Request Bulletins No. 137A (Boiler Cleaning) and No. 155C (Industrial Vacuum).

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

For more facts circle 577 on Reply Card

NEW PRODUCTS

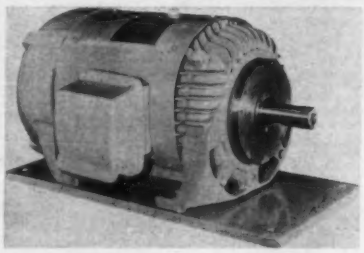
(Begins on page 156)

maintenance costs of cloth filtration methods to such difficult dust and fume problems as common to cement kilns, metallurgical furnaces, calciners, and processes involving corrosive chemicals, steam micronizers, others. Fuller Co., General American Transportation Corp.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 215-216. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

23—WHEELHEAD MOTOR for high-precision work

This precision wheelhead motor for grinding wheel applications is constructed to isolate 120-cycle vibration produced in the magnetic iron, thus eliminating a cause of blemishes on



ground surface of work. The rotor of this motor is balanced to 0.0001 in. An external means is provided for balancing rotor to eliminate disassembly for final balancing, allowing balancing on its own bearing and with bearing properly sealed. Normally built with Class A insulation, rated 55 C rise, Class B insulated motors can be built with 55 to 75 C rise. Motor can also be used for other high precision motor applications. Westinghouse Electric Corp.

24—FLOOR POLISH prevents discoloring, darkening

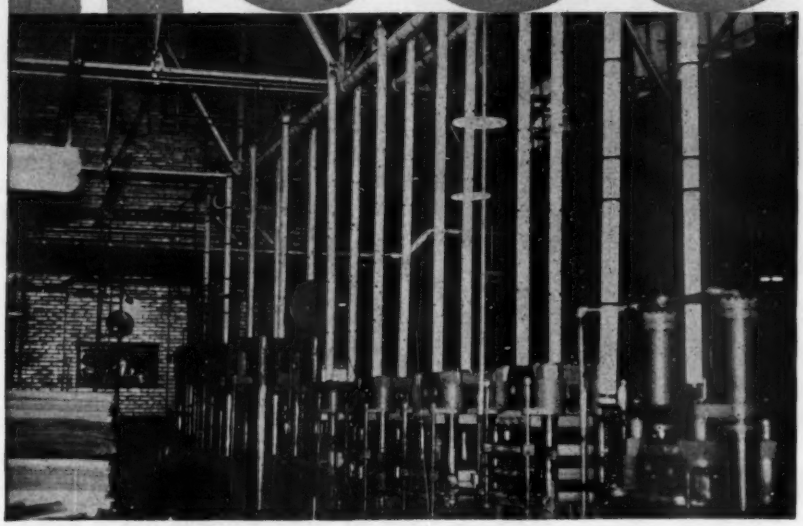
Contrast is announced as a non-slippery, wax-free floor polish developed especially to prevent discoloring or darkening of vinyl, asphalt tile, vinyl asbestos, linoleum, terrazzo and rubber tile floors. According to manufacturer, the self-shining polish has a water base which will not discolor even pure white floors. Contrast produces a tough,

ROSS Air Systems

Engineered Atmospheres for Better Processing

ROSS SUPERTHERM

UNIFORM
LOW COST
HEAT FOR
PROCESSING
AND SPACE



Section of the Supertherm System serving the presses.

The First Installation in the U. S. (1936) Still Proves its Economy and Efficiency for Providing Process Heat

Synthane Corporation, of Oaks, Pa., producers and fabricators of Laminated Plastics for Industry, installed the Ross-Supertherm High Pressure Hot Water System for providing *uniform* heating . . . and *uniform* cooling . . to its presses and treating ovens. Cooling is included because the same medium serves for both heating *and* cooling.

Uniformity of heating and cooling is the key to consistently high end-product quality. Right from the start the Supertherm System provided this better than the previous steam system. It proved its economy after the change-over, too, because this system provided 26% greater efficiency than the good steam system previously in use.

The many users of the Supertherm System in the States and Canada get not only a more uniform heat at temperatures that can go to 400°F and beyond, but also a more economical heat. The process benefits and the economies are so attractive that anyone planning a new process or to use space requiring heat should investigate the Ross-Supertherm System. Likewise those who are dissatisfied with their present heating methods.

M-R

THE MIDLAND-ROSS GROUP OF COMPLEMENTING SERVICES

J. O. Ross Engineering, New York
John Waldron Corporation, New Brunswick, N. J.
Andrews and Goodrich, Boston
Ross Engineering of Canada Limited, Montreal
Ross Midwest Fulton, Dayton
Hartig Extruders, Mountainside, N. J.
Conner Ross Engineering Company, Ltd., England

J. O. ROSS ENGINEERING

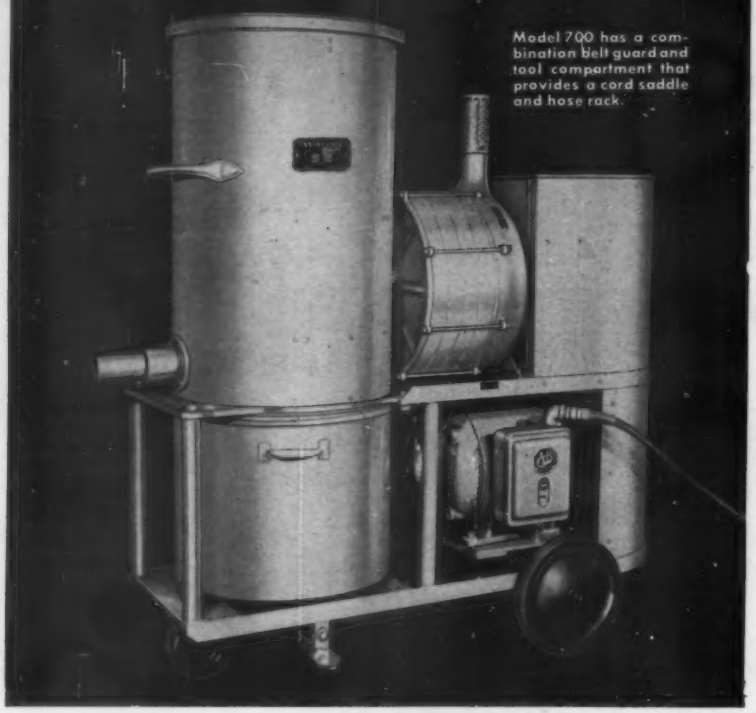
Division of Midland-Ross Corporation
730 Third Avenue, New York 17, N. Y.
ATLANTA • BOSTON • MT PROSPECT, ILLINOIS
DETROIT • LOS ANGELES • SEATTLE

For more facts circle 578 on Reply Card

outstanding...

New INVINCIBLE

7½ H.P. Vacuum Cleaner



Model 700 has a combination belt guard and tool compartment that provides a cord saddle and hose rack.

MODEL 700 IS SPECIALLY DESIGNED FOR:

- *Pipe Line Installations*
- *Material Conveying Problems*
- *Oversize Maintenance Jobs*

POWERFUL—Invincible Model 700 is engineered for rugged, *continuous* use. The 7½ H.P. Motor drives a powerful 5-stage turbine unit that will rapidly handle not only dirt but metallic parts, liquids, chemicals, foodstuffs, etc. Even abrasive material presents no problem, because complete separation precedes the vacuum producer.

LIGHT AND COMPACT—Weighing only 550 lbs., Invincible Model 700 can be rolled by one man with ease. It is 54½″ high, 54″ long and 23″ wide.

ENGINEERED TO YOUR NEEDS—Competent Invincible engineers can adapt Model 700 to *special* production or materials handling jobs. They can supply the proper primary tanks, cyclonic separators or attachments.

WRITE FOR FULL DATA

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

For more facts circle 579 on Reply Card

NEW PRODUCTS

(Begins on page 156)

glossy finish ideal for heavy traffic areas, company says; it will not water spot, powder or flake off, and is scuff-resistant. Traffic lanes may be patched and worn surfaces recoated. Huntington Laboratories, Inc.

25—MULTI-POSITION CRANE has a 14-ft lift

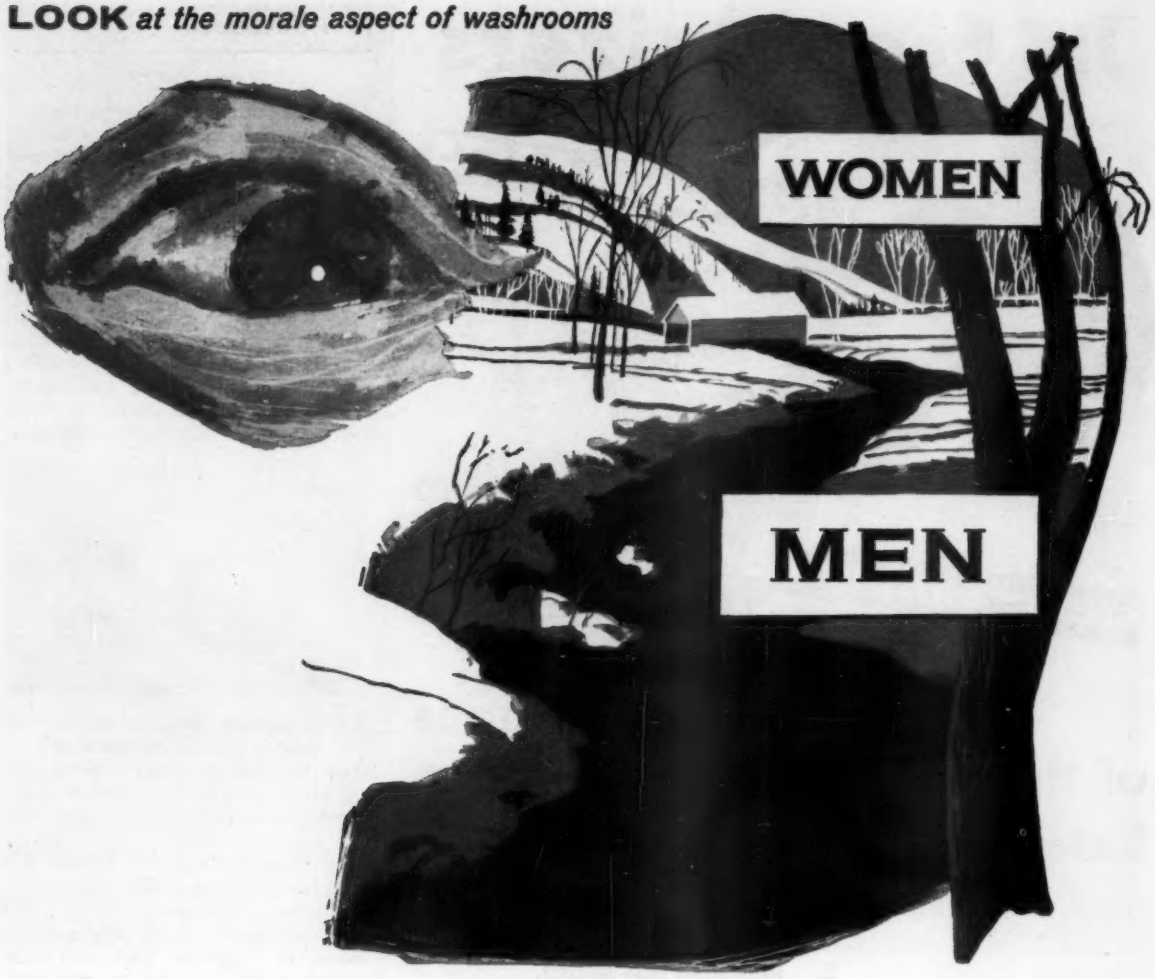
With mast and boom fully extended High Boy will lift weights up to 750 lb to a height of 14 ft, it is announced. Mast and brace telescope as one unit and, company says, are raised up or down by a hand winch mounted on mast. Boom brace automatically moves

with mast. When boom is retracted to fully horizontal position, High Boy can be moved through standard doorways. Maximum lift capacity is 1250 lb with boom retracted to 34 in. and mast and brace to lifting height of 8 ft 8 in. A sheave block and 45 ft of 3/16 in. wire rope is standard equipment and permits double reaving for extra heavy loads. Two models are available—Model WC557-AF for heavy loads on hard floors, and Model WC557-AR for lighter loads, rough floors, outdoors. Thern Machine Co.

26—REPAIR KIT for industrial plastics, wood, metal

For quick, inexpensive repairs to plastic, wood and metal, this kit contains industrial putty and resin, fibre glass cloth tape for reinforcement, and mixing and measuring tools. Among uses suggested by manufacturer are repairing leaks in gas, water, drain and other piping; leaks in tanks, roofing, etc. With the putty and reinforcing tape, substantial holes can be filled and repaired permanently or, if preferred, on a temporary basis. Putty or resin is mixed with the hardener and applied over a clean, dry surface; it dries in 20 min and reaches full strength in 8 to

LOOK *at the morale aspect of washrooms*



"HEALTHY" FRESHNESS

A clean, fresh atmosphere in washrooms pleases everyone. Makes washrooms "feel" clean. Reflects management concern for individual health and welfare.

This kind of freshness is easily maintained with modern automatic West deodorizers that contain a pleasantly perfumed aromatic fluid. These modern devices are neatly encased in white plastic. They are loaned, installed and maintained free of charge — as part of the WEST WASHROOM SANITATION PROGRAM.

The WEST WASHROOM SANITATION PROGRAM includes heavy-duty cleaners and disinfectants for facilities at regular intervals. Cleaners prevent drain clogging from salt buildup. Disinfectants kill micro-organisms that cause T.B., Polio, Typhoid, Influenza and other diseases.

Important too, the WEST PROGRAM gains the support of custodians so that they maintain high standards of sanitation.

The WEST WASHROOM SANITATION PROGRAM often saves enough to pay for itself. It includes an analysis of materials and methods that simplifies maintenance and leads to savings in towels, soap and other supplies. For full details, phone your nearby West office. Or mail the coupon to our Long Island City headquarters, Dept. 13.

☐ Send information on your WASHROOM PROGRAM.

☐ Have a Specialist phone for an appointment.

Name_____

Position_____

PROGRAMS AND SPECIALTIES
FOR PROTECTIVE SANITATION
AND PREVENTIVE MAINTENANCE

WEST CHEMICAL PRODUCTS INC.

WEST DISINFECTING DIVISION

WEST CHEMICAL PRODUCTS INC.
42-16 West Street, Long Island City 1, New York
Branches in principal cities
CANADA: 5621-23 Casgrain Avenue, Montreal

For more facts circle 580 on Reply Card

In Economizers

Here are 7 advantages of the new... Green Cast Iron Extended Surface Economizer:

1. Lasts longer.
2. Requires less space.
3. Has lower draft loss.
4. Is more corrosion-resistant.
5. Is more erosion-resistant.
6. Withstands lower feed-water temperature.
7. Costs less.

* For replacement of present steel tubes or on new boiler installations.

SAVE MONEY WITH GREEN CAST IRON FUEL ECONOMIZERS

Green

THE GREEN FUEL ECONOMIZER CO., INC.

BEACON 3, NEW YORK

For more facts circle 581 on Reply Card

NEW PRODUCTS

(Begins on page 156)

16 hr. A "promoter" is available for instant hardening and for use under cold weather conditions. The Fibre Glass-Evercoat Co., Inc.

27—WEATHERSTRIP seals out drafts, leaks, dust

According to manufacturer, this weatherstrip is unobtrusive, tough and so efficient that it stops sounds, drafts, leaks, light and dust at both exterior and interior openings. It consists of a strip of aluminum alloy with vinyl insert having four soft continuous

ridges, each of which molds itself to the door to provide insulative action. The aluminum alloy may be pre-painted to the jamb color so that it is almost unnoticeable when installed. The vinyl does not become soft or sticky and is too tough to be "picked at," says company; this weatherstrip should last as long as the door.

Installation is fast. The strip material comes in a standard pack with each length already mitered on one end. You cut the strip to size and screw it to the door. Screw slots allow adjustment to the "wind" of the jamb and to any warp found in the door. Pemko Mfg. Co.

28—RELIEF VALVES for hot water heating boilers

ASME rated pressure safety relief valves, 740 Series, for hot water space heating boilers come in ¾-in. to 2-in. sizes. High discharge capacities are said to make them applicable and economical for boilers previously requiring larger valves for sufficient protection. Watts Regulator Co.

29—SILVER PREFORMS aid automatic soldering

For automatic soldering at high temperatures these preforms are available as rings, discs, washers, pellets, castings, balls and special shapes. Ranging in soldering temperatures from 1600 to 1800 F, the preforms consist of a predetermined amount of a spe-

No slips, slides or skids with A. W. ALGRIP flooring. It's the world's *only* rolled steel abrasive floor plate, and an important aid to plant safety.

A. W. ALGRIP rolled steel floor plate is produced by Alan Wood Steel Company by a patented process in which an abrasive—just like the kind that is used in grinding wheels—is embedded to a specific depth. It becomes an integral part of a tough steel plate.

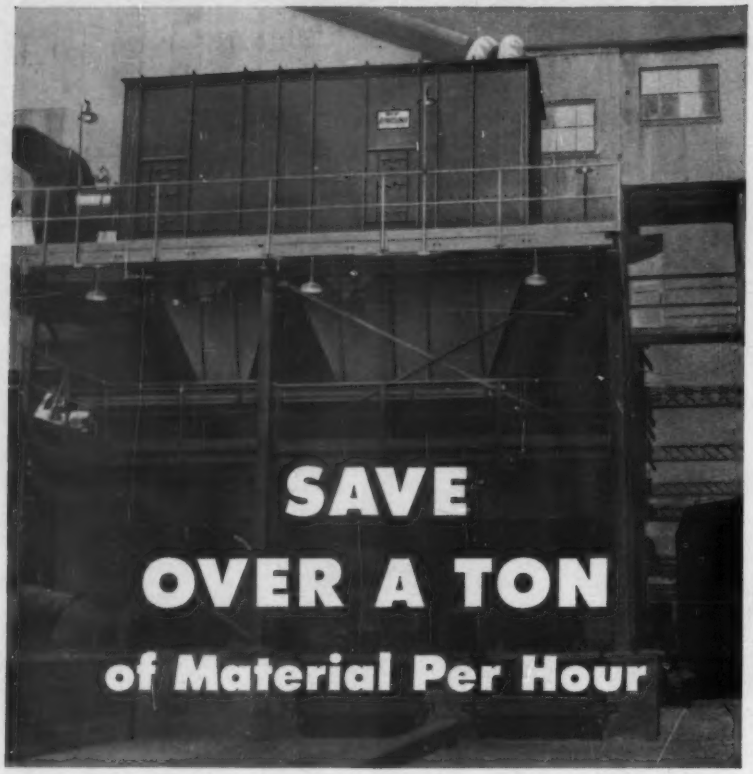
A. W. ALGRIP can be used as independent flooring . . . or as flooring overlay. Put your plant on a safe footing, with A. W. ALGRIP . . . Approved for Safety by Underwriters' Laboratories. Write for Bulletin AL N-4.

ALAN WOOD STEEL COMPANY
CONSHOHOCKEN, PA.

DISTRICT OFFICES: Philadelphia • New York • Los Angeles • Boston • REPRESENTATIVES: Atlanta • Buffalo Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver, Canada—A. C. Leslie & Co., Ltd.

For more facts circle 582 on Reply Card

SLY® DYNACLONES®
at American Potash



At its Trona, Cal., plant, American Potash & Chemical Corporation uses 4 Sly Dynaclone Dust Filters at the Borax Refinery, Borax Shipping Station, Coarse Granular Potash Plant, and Potash Shipping Area (pictured above). During every hour of operation, the Dynaclones recover an estimated 1260 pounds of borax and 1140 pounds of potash.

In addition to these substantial material savings, the Dynaclones are the key to improved health and safety, better housekeeping, more efficient plant operation. Good performance, long bag life and nominal maintenance requirements are noteworthy Dynaclone features.

Put the "Roll-Clean" Dynaclone to work on your continuous processes. Benefit from these advantages: Constant, uniform suction at dust sources, 24 hours a day if required. Automatic bag cleaning. More cloth per cubic foot of filter. New "Resist-O-Wear" filter bags (patent pending) — as much as 3 times longer life.

Get complete Dynaclone details . . .

Send for Catalog 104

SINCE 1874 SLY

THE W. W. SLY MANUFACTURING CO.

4600 TRAIN AVENUE • CLEVELAND 1, OHIO
OFFICES IN PRINCIPAL CITIES

OVERSEAS LICENSEE: ANDREW AIR CONDITIONING LTD., LONDON S.W. 1. ENGLAND

For more facts circle 583 on Reply Card

NEW PRODUCTS

(Begins on page 156)

cific silver alloy to assure melting at proper temperature and correct volume of solder. Because of the controlled amount of solder in each shape, these preforms eliminate scrap, manufacturer points out, and it is necessary to store only the specific amount of solder required for a specific job. Alloys Unlimited, Inc.

30—DRIP PROOF MOTORS with greater usefulness

Sterlicone Multi-Shielded Motors are specifically designed to operate under adverse conditions of continuous and excessive moisture, high humidity and temperature, salt spray, dust, oil and chemically contaminated atmospheres

previously requiring totally enclosed fan-cooled protection. Flexible insulation is achieved by multiple application and controlled processing of a silicone sealing compound. This insulation is described as thin, non-porous, yet permanently resilient and flexible. It will not chip, crack, peel or separate under extreme temperature, says company; its superior heat dissipation allows smaller ratings to be used and it is not subject to stress concentration or production of hot spots. The motors come in ratings from ½ to 50 hp, any phase, frequency or voltage, torque or slip characteristics, and with multi-speed winding. Sterling Electric Motors.

31—METAL PRIMER for protection against rust

Rust Magic Metal Primer—spray or brush type—dries in 20 min, it is announced, and is compatible with almost any finish coat. Primer contains a phenolic resin penetrant which carries the pigment and vehicle through sound rust and locks itself tight to the substrate, sealing the surface to moisture and preventing further rust de-

Improved cutting performance... plus rancidity control

From Esso Research after two years of field testing comes a new heavy-duty emulsifiable cutting oil that combines all these outstanding advantages:

Deeper cuts, faster speeds, longer tool life. Kutwell EP 66 contains extreme pressure agents that enable it to handle the toughest cutting, grinding, sawing and drilling jobs. Milling a high-alloy steel, for instance, a jet engine component manufacturer reports output jumped from 35 to 117 pieces per tool grind after Kutwell EP 66 replaced a high-cost specialty oil.

Machine lubrication—Kutwell EP 66 leaves an easy-to-see film of oil on the ways, cams and working parts of the machine tool for highly efficient lubrication.

Rancidity control — Kutwell EP 66 contains an effective bactericide selected by Esso Research to keep emulsions sweet smelling and serviceable for longer periods of time.

For special alloys and other tough machining jobs, Kutwell EP 66 will outperform conventional soluble cutting oils and many high-cost compounded mineral oils. An Esso representative will be glad to show where Kutwell EP 66 can do a better job in your operation.

Call the Esso office nearest you, or write: Industrial Lubricants Division, Esso Standard Oil Company, 15 West 51st Street, N. Y. 19, N. Y.

Esso

In Industry after Industry..."ESSO RESEARCH works wonders with oil"

For more facts circle 584 on Reply Card

Veeder-Root Electronic Counters . . .

SERIES 1604

PRE-CONTROL
MACHINES and PROCESSES
AUTOMATICALLY!

Electronic Pre-Control is the new, accurate and easy-to-use method for *count*-rolling almost any high output machine or process: batching, filling, length measurement, materials handling, sorting, packaging, stacking, shipping and similar operations. Just set dial to preset quantity and counter takes over.

SERIES 1601

No. 1601 Electric Predetermining Counter features automatic reset. Control contacts operate and hold for 0.3 seconds . . . or for 2 seconds . . . or indefinitely. Counter can be modified for automatic sequential predetermining, using two or more preset numbers. Batch or totalizing feature available. Speeds up to 1000 counts per minute.

No. 1604 High Speed Electronic Predetermining Counter with Automatic Reset, features instantaneous recycling. Up to six decade counters, with one, two, or more sets of preset numbers . . . with or without photohead or enclosure. Output relay provides momentary or indefinite holding time. Batch totalizing available. Ideal for all high speed requirements, operating up to 5000 counts per second, recycle at 1000 cps.

Send for New Preset Counter Bulletin . . . Complete information on the complete Veeder-Root Predetermining Counter line. Send today.

Veeder-Root
HARTFORD 2, CONNECTICUT
"The Name that Counts"

New York · Chicago
Los Angeles
San Francisco
Seattle · St. Louis
Greenville, S. C.
Altoona, Pa.
Montreal
Offices and Agents in other principal cities

V99-84

For more facts circle 585 on Reply Card

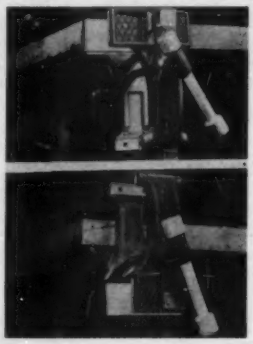
NEW PRODUCTS

(Begins on page 156)

velopment. Porous rust is neutralized and becomes an actual ingredient of the paint film, company says, and surface may be topcoated in two hours with spray paints, lacquers, enamels, oil base paints, vinyl, acrylic, latex or water base paints. Krylon, Inc.

32—COMBINATION VISE with jaws for wood, metal

The Universal Turret Vise, equipped with wood clamping as well as metal clamping jaws, is announced as combining all features of woodworkers and metalworking vises. The 2-in-1 tool turns from one type of work to the



other, a half turn of the locking knob lets either set of jaws be rotated into correct working position, and another half turn of the knob locks the vise in position. With a maximum opening of 6 in. the vise is capable of nearly any type of work in a general shop, manufacturer states. The combination vise has a 3-by-7 in. woodworking jaw, a serrated steel jaw measuring 1 by 4 in., and a pipe holding capacity from ¼ in. to 4½ in. Wilton Tool Mfg. Co. Inc.

33—REVERSE RELAY for "fail-safe" protection

Pneumatically-controlled industrial processes can be given "fail-safe" protection in case of air line failure with the compact Type 783 Reverse Relay, it is announced. It is an auxiliary device which gradually reverses the action of pneumatically operated valves, motors and dampers; it connects normally-closed pneumatic equipment to normally-opened operation. When air supply pressure falls to zero, the equipment is designed to revert to its normally-closed position and shut down. This relay's size, 1-9/16 in. diam by 2⅝ in. long, is 60 per cent smaller than its prede-

FROM GENERAL ELECTRIC . . .

NEW *Polyseal** *Insulation Systems*

• Sealed Against Contaminants

• Help Cut Motor Costs

MOTOR SAVINGS OF UP TO 50% are now possible by applying General Electric motors with Polyseal insulation systems in many outdoor, high moisture, dust and other severe atmospheres which formerly required additional enclosure protection.

POLYSEAL INSULATED COILS are vulcanized and cured—to bond and seal the supported silicone rubber tapes. Every coil must pass an underwater hi-pot test to make sure it is positively sealed against moisture and other contaminants.

THIS NEW GENERAL ELECTRIC INSULATION system also provides greater thermal, voltage and environmental endurance than conventional systems. For added mechanical strength, glass fabric supporting materials are imbedded in each layer of tape. Each coil is wrapped with many layers of this tape. Coils are securely held in the motor by G.E. patented tying and bracing techniques.

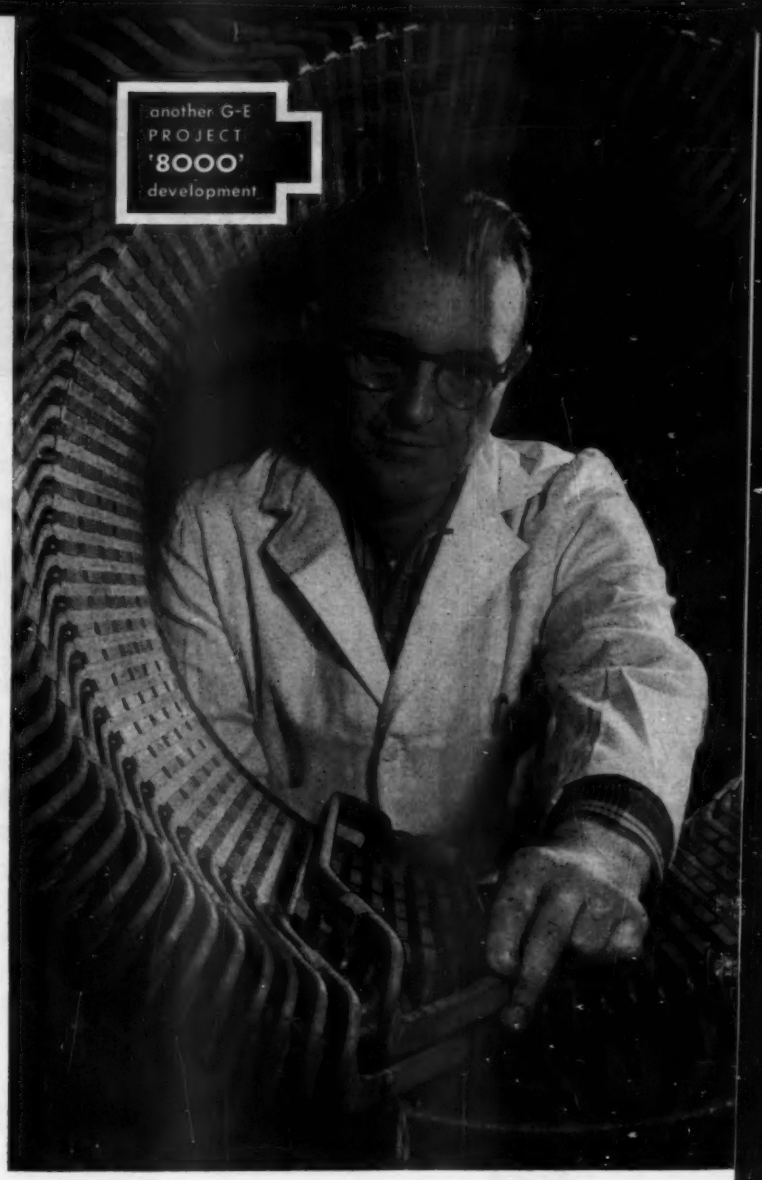
ALSO AVAILABLE IN G-E RANDOM-WOUND MOTORS, the Polyseal system is used for stator and end turns, sealing windings with a waterproof, inert covering.

FOR MORE INFORMATION on Polyseal Insulation Systems, call your nearby G-E Apparatus Sales Office, or write for bulletin GEA-6889, Section 884-4, General Electric Co., Schenectady, N. Y.

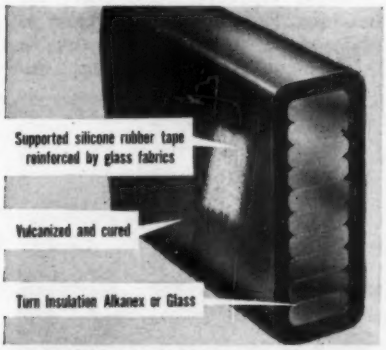
PROJECT '8000' . . . a major General Electric program of research, redesign, advanced manufacturing and improved customer service on A-c motors 150 to 6000-hp.

*Trademark of General Electric Co.

GENERAL ELECTRIC

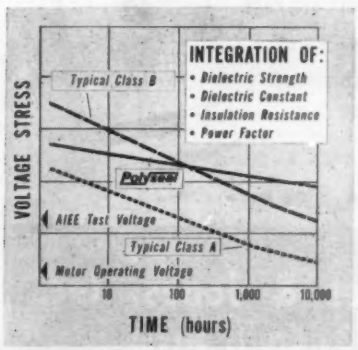


FULLY SUPPORTED



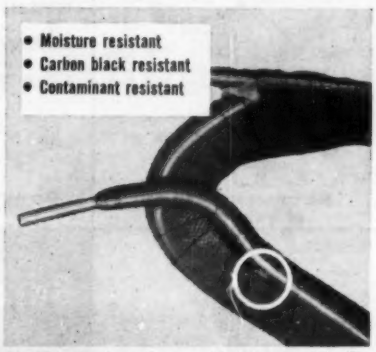
Using specially developed G.E. supported silicone rubber tape, Polyseal is the first silicone rubber insulation system on the market that is fully supported against mechanical breakdown.

LONG LIFE



Tested over long periods of time with voltage applied, General Electric's new Polyseal silicone rubber insulation systems retain a much higher dielectric strength than other commonly-used insulations.

COMPLETELY SEALED



Positive lead seal is provided by special silicone rubber compound which vulcanizes the lead tubing to the silicone rubber wall of the coil. This effectively seals the coil against contaminants.

For more facts circle 586 on Reply Card

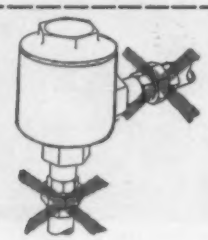
Now . . . from Barnes & Jones . . . the BIGGEST DROP in Steam Trap Maintenance in 50 Years!

No parts — no assembly.

Barnes & Jones has been recognized for over half a century as a leader in thermostatic traps for the heating trade. Now — the same basic cage unit feature that revolutionized radiator traps thirty years ago is available for high pressure process steam applications.

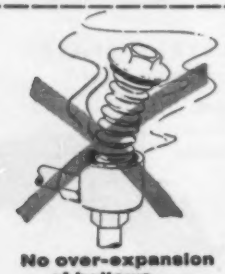
No special tools or shop required.

Now — costly, time-consuming steam trap repairs are outmoded. For with this new B-J Cage Unit replacement, you simply drop a complete new interior into the trap and it's new again. And if steam trap maintenance is a bugaboo with you — it's the best and biggest drop you can make.



No need of unions.

Also — Barnes & Jones Cage Unit interiors are available to renew other makes of industrial traps.



No over-expansion of bellows.

If you're interested in saving steam, cutting repair and maintenance time and improving trapping efficiency, write today for "The Steam Trap Primer". You'll see the 'hows' and 'whys' of steam trap performances. And perhaps you'll see how B-J high pressure traps and cage units can end your steam trap problems.

Be Wise . . . Be Sure . . . B-J

Barnes & Jones, Inc.
34 Crafts Street
Boston 60, Massachusetts

For more facts circle 587 on Reply Card

NEW PRODUCTS

(Begins on page 156)

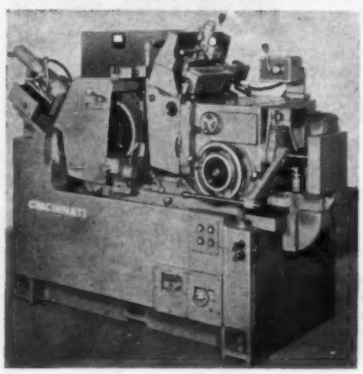
cessor. It mounts on a valve or damper motor, behind control panels, or next to a wall-mounted controlling instrument.

The relay operates on a force-balance principle, balancing pressure of supply and exhaust air against a calibration spring. The fixed 1:1 input to output ratio produces a 1 psi change in return pressure for each such change in thermostat pressure; air is used only when the pressure changes. A removable cover protects the adjustable reversing spring. Fittings are 1/16 in. NPT. Normal supply pressure is 15 psi; maximum, 25 psi. Maximum temperature is 160 F, minimum —20 F. More information is in Form P-82. The Powers Regulator Co.

Reader Service Cards on pages 215-216 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

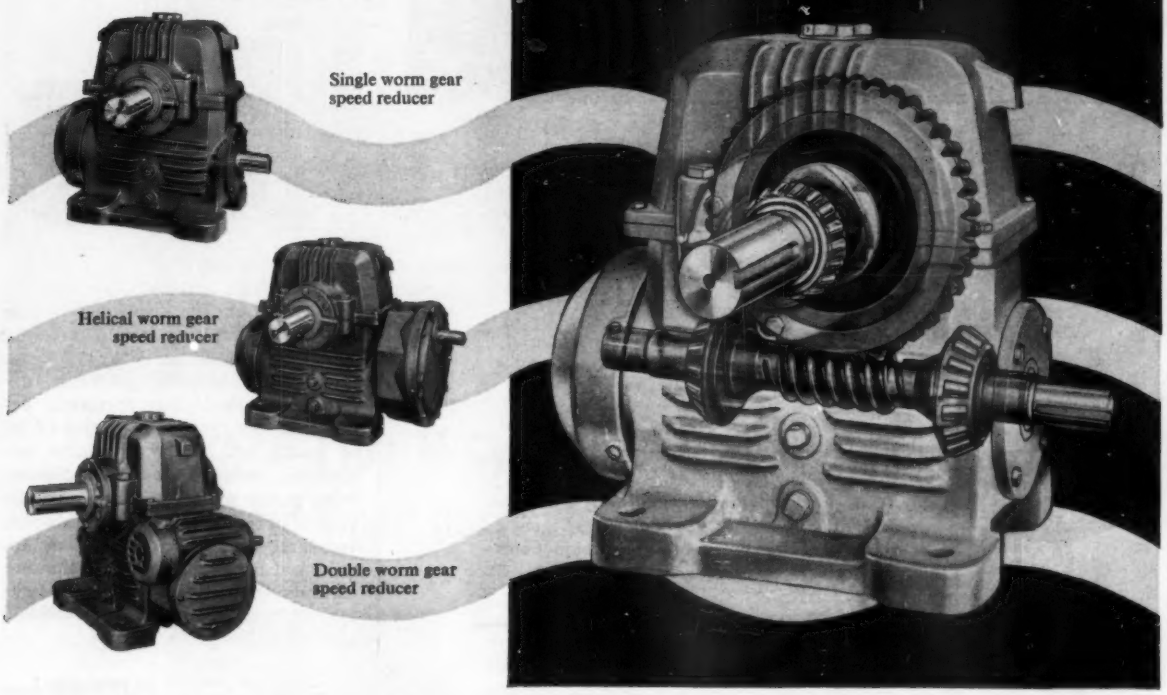
34—CENTERLESS GRINDER does short run work

Designed specifically for quick and easy change-over and operator convenience, the 210-6 Centuramic is a 10-hp machine for handling up to 3-in. OD work. It has a standard 6-in. wheel width with provision for wheels up to 8-in. wide. Several design features suit this machine for job shop operations where short runs often dictate handfeeding and frequent setups. Out-of-the-way location of coolant tank and hydraulic unit, plus a generous toe-room recess under the machine, let operator stand close to the work for dead passing or workable adjustment. The regulating wheel tru-



NEW LINK-BELT FAN-COOLED WORM GEAR SPEED REDUCERS

THREE BASIC TYPES . . .
WITH MANY VARIATIONS



most complete line in industry

Industry's most complete line of worm gear speed reducers introduces more advanced refinements for reducing high motor speeds to requirements of modern production machines. Types and sizes for every right-angle need . . . single or double reduction . . . horizontal or vertical mountings . . . ratios from 5:1 to 3600:1, torque ratings up to 135,000 pound inches, up to 150 horsepower.

Compact, self-lubricated and fan-cooled, these units operate smoothly and quietly under high input speeds. Power is transmitted at either moderate or slow output speeds, with ample capacity for heavy loads. This all adds up to high ratings, maximum heat dissipation and minimum maintenance.

For complete information call your nearby Link-Belt office or authorized stock-carrying distributor. Ask for Book 2824.

LINK-BELT
SPEED REDUCERS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World. 15,279

For more facts circle 588 on Reply Card

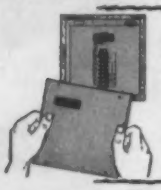
GTC

*an effective, economical industrial communication system designed to provide swift and sure voice communications regardless of distance or surrounding noise conditions.

. . . THE UNITIZED COMMUNICATION SYSTEM . . .

COMPLETELY TRANSISTORIZED AND DESIGNED TO MEET THE CRITICAL REQUIREMENTS OF INDUSTRY

1. An effective, economical industrial communication system designed to provide swift and sure voice communication under adverse environmental conditions such as extremes of temperature and noise.



2. All amplifiers are "plug-in" contributing greatly to ease of installation and MAINTAINABILITY.

3. Transistors and rugged, industrial type components are used throughout. No vacuum tubes or "entertainment" type components of any kind are employed.

4. Central Control cabinet is eliminated thus reducing space requirement to a minimum.

5. ULTRA SIMPLE WIRING PLAN (no shielded cables) and UNITIZED EQUIPMENT with integral terminal facilities make for EASY LOW COST INSTALLATION and LATER EXPANSION.

* GAI-TRONICS TRANSISTORIZED COMMUNICATIONS

GAI-TRONICS
CORPORATION
Dept. C
READING, PENNA.

A SUBSIDIARY OF GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS

GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

For more facts circle 589 on Reply Card

NEW PRODUCTS

(Begins on page 156)

ing attachment is inclined 20 deg opening the throat for easy access. Infeed adjustment wheels are available at both front and rear, and truing controls are conveniently located. The Cincinnati Milling Machine Co.

35—ULTRASONIC CLEANER for average energy levels

For small part cleaning applications in which average energy levels are required, Model 100 Standardline features a 1-gal heavy-gage stainless steel tank with rounded corners to facilitate rinsing out contaminants removed by

ultrasonic energy. This tank is 9¼ in. long, 5 in. wide and 6 in. deep, with 25 per cent of the bottom covered with driving elements and actual radiating surface of 12 sq in. The 115-v a-c single-phase, 60-cycle generator, designed for continuous operation, delivers an average power output of 60 w, peaks of 240 w. Features announced include one-tube oscillator, front panel switching which permits choice of either of two transducers, and three-wire ground protection. Interlocked for operator safety, the unit can be adjusted to available line voltage. It costs around $350. National Ultrasonic Corp.

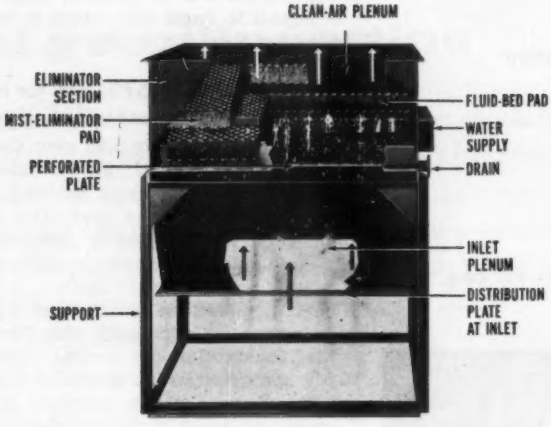
36—LOW COST PURIFIER has liquid storage reservoir

Hi-eF Type LCR Purifiers are for cleaning air and steam in lines up to 2 in. in size. This unit provides its own liquid storage so that a drainer is not necessarily required; it is blown down periodically by means of a manually operated drain valve. Suggested uses include installations immediately ahead of nut runners, hammers, vibrators, drills, blowers, sprayers and other air-operated equipment. In these the purifier removes moisture forming down stream from the aftercoolers. They are also suited for steam supply lines to ejectors, heat exchangers, dryers.

A feature stressed is low maintenance—99 per cent of moisture and

NEW WAY TO STOP PLATING FUMES!

AAF Type M Cycoils eliminate fumes from small parts plating at Burroughs



Burroughs had a fume problem resulting from inadequate make-up air and heavy fume loading from tank agitation. Their answer: a ventilating system built around new units designed *specifically for plating fume collection*—AAF Type M Cycoils.

The Cycoils achieve higher collection efficiencies than conventional collectors—yet are *lighter, less bulky* and *lower in cost!* For more information on the Type M Cycoil, call your local American Air Filter representative, or write direct for Bulletin 286. Address: Mr. Robert Moore, American Air Filter Company, 228 Central Avenue, Louisville, Kentucky.

AAF **American Air Filter**

BETTER AIR IS OUR BUSINESS

For more facts circle 590 on Reply Card

SPECIAL ZINC-RICH COATING GIVES GALVANIC PROTECTION TO METALS

Galvanox is a special coating composed of an extremely high percentage of metallic zinc in an organic binder. The resulting film supplies an electro-chemical type of protection long associated with galvanizing. Applied as a paint, it dries and "cures" to form a very dense coating of metallic zinc.

Galvanox comes ready-mixed in a natural zinc color only and has specialized uses and applications, as:

- For replacing galvanizing
- For reconditioning galvanizing
- For covering arc welds and welding
- For use in conjunction with cathodic protection
- For use as an electrical conductor
- For minimizing electrolysis
- For use as a metal filler
- For underwater, underground or high humidity exposures.

Learn more about the application of Galvanox and its low cost. Write today for a copy of "Galvanox by Subox."

SUBOX PAINTS

Subox Inc.

Established 1924

3 Fairmount Plant, Hackensack, N. J.
Subox Company of Canada, Weston, Toronto 15

For more facts circle 591 on Reply Card

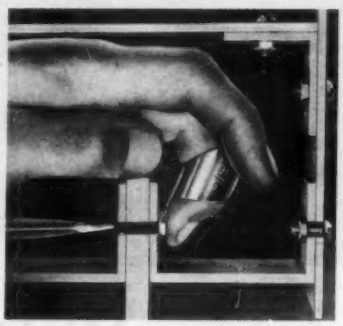
NEW PRODUCTS

(Begins on page 156)

damaging particles are claimed to be removed by a separation principle employing controlled centrifugal scrubbing. Other advantages noted include handling of heavy liquid slugs and fine mist with equal efficiency, low initial cost, maintenance of full pressure in operating equipment, nonclogging action. Reservoir capacity ranges from ½ pt for ¼-in. size to 6½ pt for 2-in. size. Units are designed for up to 400 psig service, 500 F. Bulletin 503 gives details. The V. D. Anderson Co.

37—FINGER-TIP WRENCH for hidden work areas

Touch 'n Hold Wrenches are designed to let you reach into snug, narrow, remote or hidden working areas—to

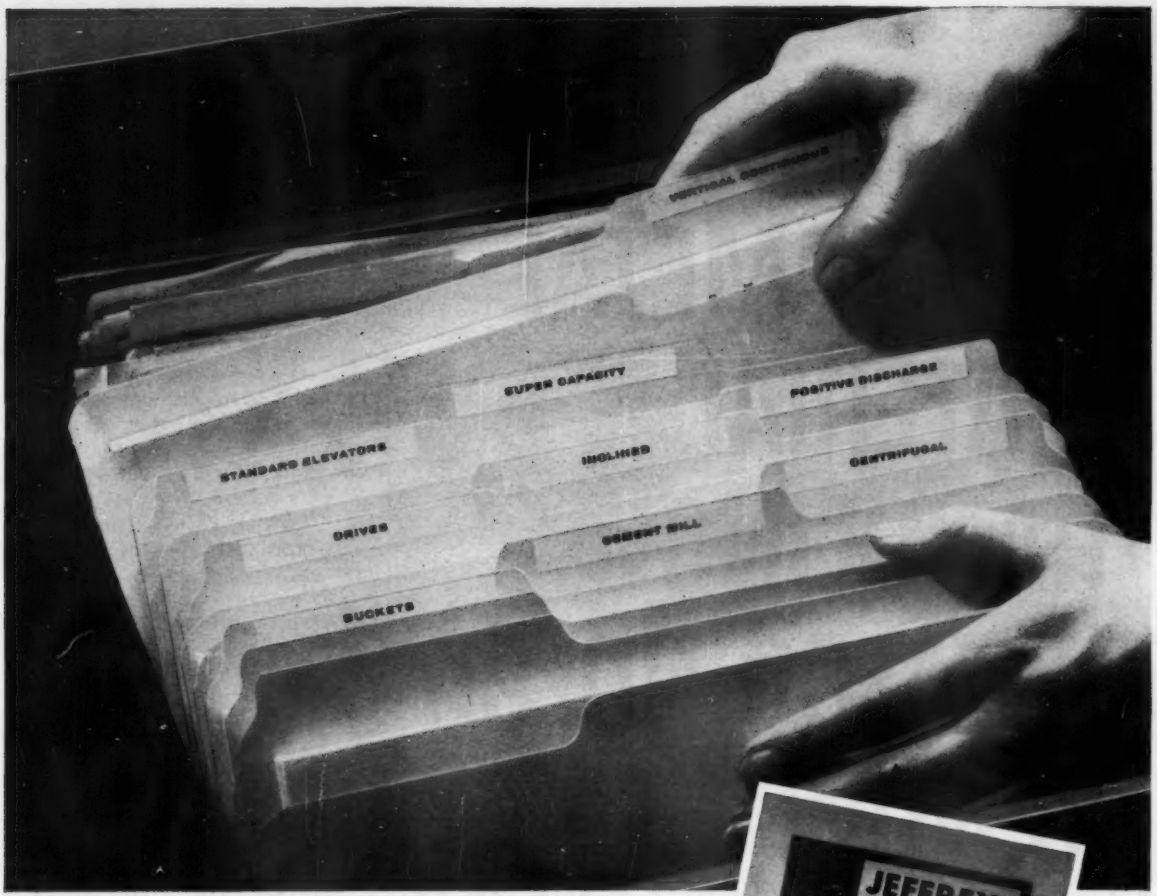


touch 'n hold a nut or bolt in a true fixed position for assembly or disassembly. This wrench is worn like a ring on the finger without restricting free motion of hands or fingers. It adjusts to finger size, comes in hex head nut sizes. Beaver Tool Co.

38—CONTROL SYSTEM for industrial process installations

PowrMag Systems are solid state, electronic controls containing no tubes, slide wires or transistors, yet said to have almost universal application to industrial process control. Adaptable to simple single controller installations or to large multiplant systems with direct tie-in to data processing or digital computing equipment, the PowrMag analog computer concept reportedly embodies a high degree of flexibility. Because of the universal language and design techniques of analog computers, PowrMag control is claimed ideal for new systems or for expansion of existing control facilities where pneumatic loops must be tied into new equipment.

A typical PowrMag System consists of four basic elements: 1) input trans-



Have complete Jeffrey bucket elevator facts at your fingertips

Jeffrey offers a complete range of bucket elevator systems and components for elevating bulk materials from fines up to 8 inch lumps. You can have complete facts at your fingertips by sending now for this new 96-page catalog complete with types, weights, dimensions and capacities.

This catalog can simplify your planning of elevating systems—and ordering standard replacement parts for fast delivery. Use coupon for your free copy. The Jeffrey Manufacturing Company, 905 North Fourth Street, Columbus 16, Ohio.

The Jeffrey Manufacturing Company
905 North Fourth Street • Columbus 16, Ohio
Please send copy of new catalog on bucket elevators

*Your Name*_____

*Company*_____

*Position*_____

*Address*_____

*City*_____ *Zone*___ *State*_____

JEFFREY

CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

For more facts circle 592 on Reply Card

THE NEW UNION METAL MATERIAL HANDLING CATALOG NO. 90 IS NOW AVAILABLE UPON REQUEST

For your obligation-free copy of Catalog No. 90 describing new designs . . . new economies . . . and new efficiencies in pallets, skids and boxes for unit load handling, write direct to The Union Metal Manufacturing Company, Canton 5, Ohio, or use the handy "Information Request Card" enclosed in this publication.

UNION METAL
Material Handling Equipment

For more facts circle 593 on Reply Card

NEW PRODUCTS

(Begins on page 156)

ducers which convert input variables such as pressure, flows, temperatures and level into 1-9 v d-c electrical signals; 2) analog control computers which add, subtract, multiply, integrate, differentiate and perform other functions; 3) remote control stations, located on the central control panel, which provide process set point, bias, ratio and other manually set control operations with output and null indicators; 4) final control units, such as electro-penumatic and electro-hydraulic values and power positioners. Bulletin MSP-163 gives data. Hagan Chemicals & Controls, Inc.

39—V-BELT PULLEY with micrometer adjustment

This 3¼-in. diam variable pitch V-belt pulley has micrometer adjustment to set pitch to desired rpm required on driven pulley. It can be used with ⅜-, ½- and ⅝-in. top width V-belts. Each half of the pulley is directly

fastened to the motor shaft to eliminate parallel or angular misalignment between halves. Adjustment is made by turning a socket cap screw on the end of the hub after loosening one half of the variable from the shaft. The adjusting half moves parallel with the shaft and once a setting is reached, the fastening set screw is tightened, again securing the variable half to the shaft—a method of adjustment claimed more positive than conventional variables. Also claimed is better concentricity between groove and bore (0.010-in. total indictaor reading—maximum), and this serves to minimize belt hop. Bore sizes of ½ to ⅝ in. are available. Congress Drives Div., Tann Corp.

40—SHEET PACKING of compressed asbestos

Designed primarily as a gasketing material, this compressed asbestos sheet packing comes in eight basic grades in standard size sheets. Of these, commercial grade black or white sheets are for general purpose industrial applications involving steam, gas and air at high temperatures. Intermediate grade sheets are offered for service against gases, steam and air at higher temperatures up to 700 F. Navy grade

NO SUPPLEMENTARY LIGHTING—Here inside the new wing of Assembly Products, Inc., the Power Groove general lighting does all the work—without supplementary lighting—improving appearance and efficiency, reducing initial cost and operating expense.

"Our new building cost us 50¢ a square foot less—just by using new General Electric Power Groove Lamps!"

says Mr. John D. Saint-Amour, President, Assembly Products, Inc., Chesterland, Ohio

When Assembly Products, Inc., an aggressive and growing manufacturer of meter-relays, added a new wing to its plant in Chesterland, Ohio, it quickly settled on new General Electric Power Groove Lamps. Why Power Grooves? Because they got more light per lamp—so they needed fewer lamps and fixtures. They got a comfortable 250-footcandles on the work, *and saved 50¢ a square foot over the next most powerful fluorescent lamp type.*

In a recent letter to General Electric, Mr. John D. Saint-Amour, president of Assembly Products, said: "The Power Groove system recently installed in the new wing of our plant has already proved to be a valuable investment. In the older plant area, both general lighting and supplementary lighting were required. The general lighting *alone* is all that's needed in our new wing. We're confident this new lighting system will result in better, faster, and more efficient production."

PLANNING NEW LIGHTING? Then find out all about the *new* G-E Power Groove Lamps. They come in 4, 6 and 8-foot lengths—designed to deliver up to 15,000 lumens, and they're interchangeable with original Power Grooves. For more information, write: General Electric Co., Large Lamp Dept. C-938, Nela Park, Cleveland 12, Ohio.

SAVINGS ON INITIAL INVESTMENT BY USING G-E POWER GROOVES COMPARED TO OTHER 8-FOOT FLUORESCENTS

(Based on a 250-footcandle level, at about $2.06 per square foot using Power Grooves)	SAVINGS PER FOOT	SAVINGS PER 10,000 FT.
POWER GROOVES vs. 8′ HIGH OUTPUT LAMPS (at $2.56/sq.ft.)	50¢	$5,000
POWER GROOVES vs. 8′ SLIMLINE LAMPS (at $2.83/sq.ft.)	77¢	$7,700

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 594 on Reply Card

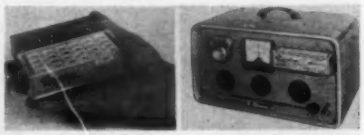
(Begins on page 156)

sheets, suitable for temperatures to 700 F, pressures to 300 psi, have average tensile strength of 4200 psi. Premium grade, is for even more severe, hazardous conditions, including steam-saturated, superheated and highly alkaline environments. These grey-black sheets have a tensile strength of 5000 psi, are for temperatures to 700 F. Top grade sealing against gasoline, oil and other petroleum distillates as well as Freons, is claimed for Neoprene grade sheets. Premium grade Neoprene sheets meet higher requirements and are suggested for sealing against hot oil and solvents of gasoline and toluol. For general chemical service, blue asbestos sheets are designed to withstand sulfuric, nitric acids at high and low temperatures. Union Asbestos & Rubber Co.

41—CAPSULE electronically controls formula

Integrated with company's Select-O-Weigh, an automatic proportioning panel, this pocket-size control consists of a network of miniature electronic components sealed in a shatterproof protective cover. Developed to eliminate manual errors in blending, proportioning and batching operations, this capsule is designed to program the sequence and weighing of up to 24 solid and/or liquid ingredients in a formula.

To pre-set the formula capsule you insert it into a portable capsule formulator and move the indicator switch



to position 1. Desired weight of the first ingredient can be set on formulator dial. Adjustment of set-screw until meter is brought into balance, assures proper proportioning. Formula identification is facilitated by a removable formula card that slips into place on the top edge of the capsule. The pre-set unit is inserted into the receiving slot of the Select-O-Weigh panel, and any operator can set the fully automatic system into action at the touch of a button. Richardson Scale Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 215-216.

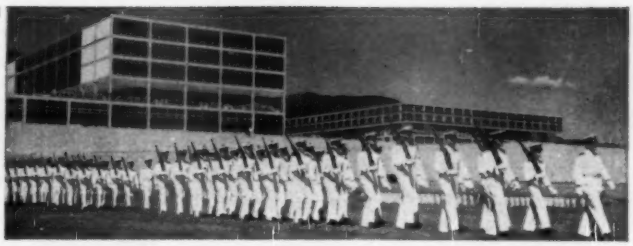
42—CONVEYOR automates paper work handling

The Hy-Clip Conveyor is designed to pick up paper forms and transport them to pre-determined stations where the paper is automatically ejected. It is composed of an endless chain and Hy-Clips—the brains of the system—which pick up paper, pass undesired stations, automatically select correct stations, and drop their paper load. Because of its lightweight, flexible components, the Hy-Clip system can travel to any point or points on one floor or between floors, company says. Barry Hyman Co., Inc.

43—RUST CONTROL COATING gives fast protection

Rustrol is claimed to provide full protection on any metal surface within the hour; it dries to the touch in 15 min, allowing two or three coats to be applied without lost time to build

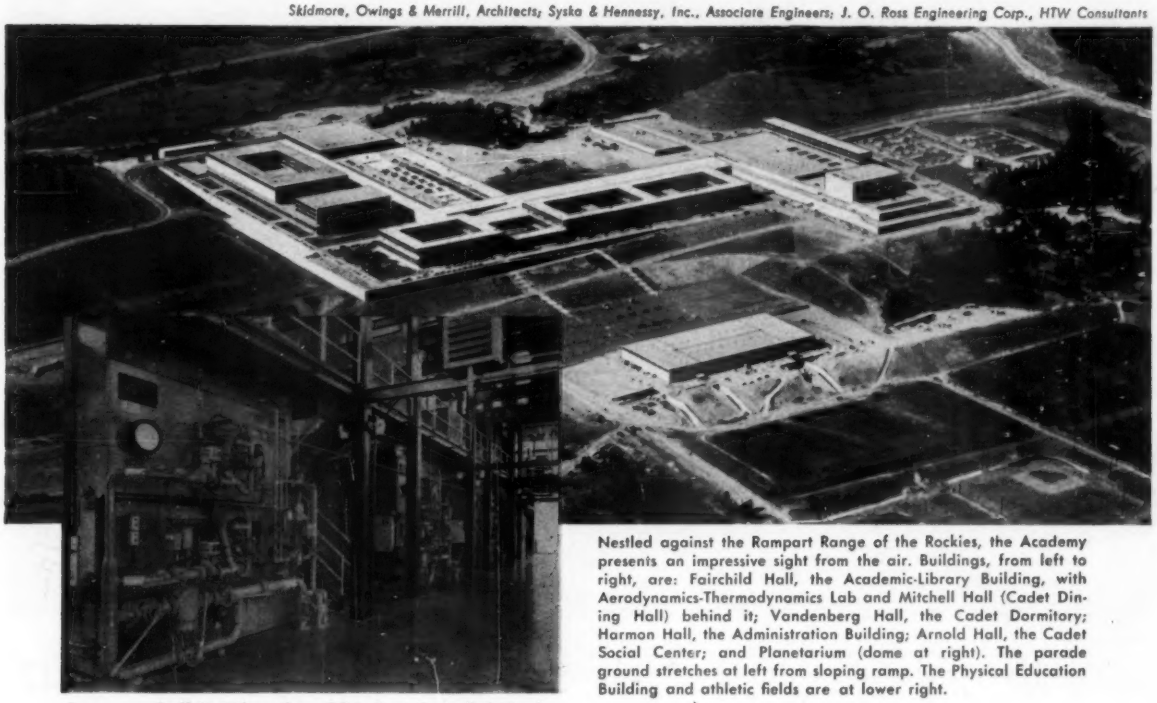
For more facts circle 595 on Reply Card



Without breaking step, students march down ramp leading from academic and cadet living area onto the parade ground.

HIGH TEMPERATURE WATER HEATS THE AIR FORCE ACADEMY

Skidmore, Owings & Merrill, Architects; Syska & Hennessy, Inc., Associate Engineers; J. O. Ross Engineering Corp., HTW Consultants



Nestled against the Rampart Range of the Rockies, the Academy presents an impressive sight from the air. Buildings, from left to right, are: Fairchild Hall, the Academic-Library Building, with Aerodynamics-Thermodynamics Lab and Mitchell Hall (Cadet Dining Hall) behind it; Vandenberg Hall, the Cadet Dormitory; Harmon Hall, the Administration Building; Arnold Hall, the Cadet Social Center; and Planetarium (dome at right). The parade ground stretches at left from sloping ramp. The Physical Education Building and athletic fields are at lower right.

Compact and efficient, these three C-E LaMont Controlled Circulation Hot Water Boilers serve in the Academy's Academic Area plant. Each has a rated output of 100 million BTUs per hour.

Nestled picturesquely in the Rampart Range of the Rockies, seven miles north of Colorado Springs, the new U. S. Air Force Academy is a fitting symbol of the prowess and prestige earned by this branch of our military

Situated on a sloping site, the Academy grounds are graded, split-level fashion, into a number of broad terraces. Elevations range between 6,400 and 7,000 feet above sea level. The school is divided into two general areas – one for service buildings and one encompassing academic, physical education, dormitory and hospital facilities.

Selecting a heating system to service these widely-spaced buildings and facilities over the rolling and varying terrain required a type that permitted easy and economical pipe line distribution over individual closed circuits exceeding six miles in length – circuits which totally encompass nearly fifteen miles.

Because of the irregular terrain and the large area, a steam system would have required a substantial number of steam traps and close attention to piping gradients. High temperature water, on the other hand, offered the advantages of smaller-sized piping with no pressure valves, and a smaller, more compact boiler plant than would have been required for steam . . . with 10 to 20 per cent reductions in operating costs.

There are five C-E LaMont Controlled Circulation Hot Water Boilers serving the Air Force Academy. They are located in two separate boiler plants – 3 in one and 2 in the other – and have been performing reliably, efficiently and with minimum operating attention since they were first placed in service in late 1957.

For details on C-E Hot Water Boilers, write for catalog HCC-2 – no obligation, of course.

COMBUSTION ENGINEERING

Combustion Engineering Building, 200 Madison Avenue, New York 16, N. Y.

Canada: Combustion Engineering-Superheater Ltd.

C-246A

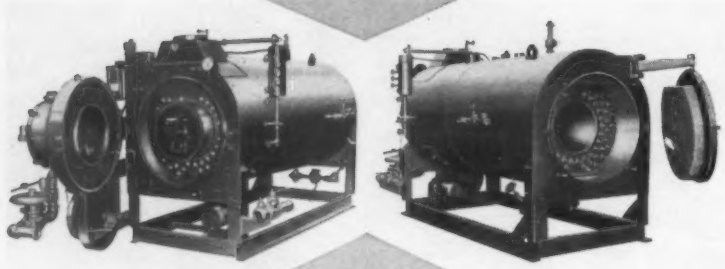
ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS, FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

For more facts circle 596 on Reply Card

BEST BUY—PACKAGE BOILERS

Continental

2-PASS DESIGN...



sizes:
20 to 600 HP steam boilers—to 250 psi
hot water and HTW boilers
oil—gas—combination
oil/gas

These features show why Continental 2-Pass Automatic Boilers are your best buy for process steam and heating services:

- easier accessibility with hinged front door, davited rear door
- higher efficiency, longer life with *balanced* internal circulation
- no separation baffles as required with "excess" passes
- compact design saves valuable space
- uniform heating of boiler surfaces
- more efficient combustion, maximum heat transfer with spinning gas technique
- simplified design eliminates need for highly skilled personnel

The following Continental features give important savings and improved performance: forced draft, quiet operation, high quality steam, quick change dual fuel burner, easy installation.

Get complete facts on why the Continental 2-Pass Boiler means real savings in operation, maintenance and first cost... Write today for new Bulletin BE 400.

CONTINENTAL BOILER DIVISION
BOILER ENGINEERING & SUPPLY CO., INC.
Phoenixville, Pa.

For more facts circle 597 on Reply Card

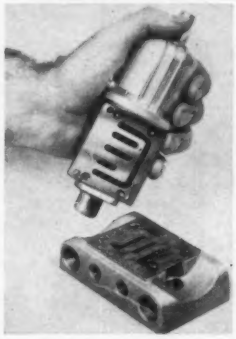
NEW PRODUCTS

(Begins on page 156)

up a thick, impervious film, essential for effective rust prevention. Rustrol, which employs vinyl plastic resins, acts to seal out moisture and oxygen. Even metal surfaces already rusted can be made sound again with it, says manufacturer. It can be applied by brush or spray to any metal surface indoors or outdoors. A deep red flat finish primer, Rustrol is said to provide a good adhesive for topcoats. Sapolin Paints Inc.

44—COMPACT AIR VALVES require no accessories

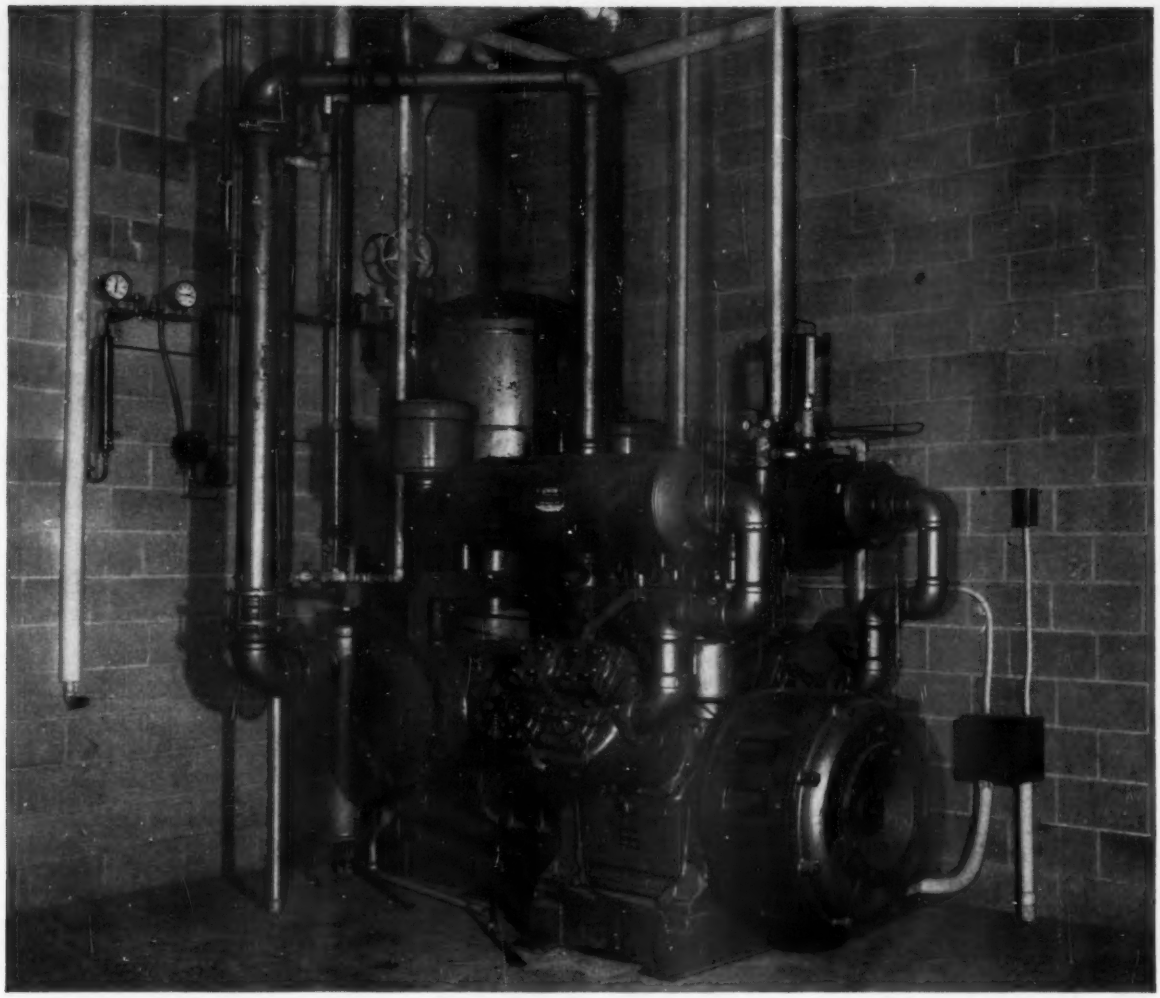
This line of direct-solenoid operated air valves includes single- and double-solenoid, four-way, three-way and four-way five port types in ¼-, ⅜- and ¾-in. sizes, all with pre-wired bodies and bases. As illustrated, the body simply plugs into the base to



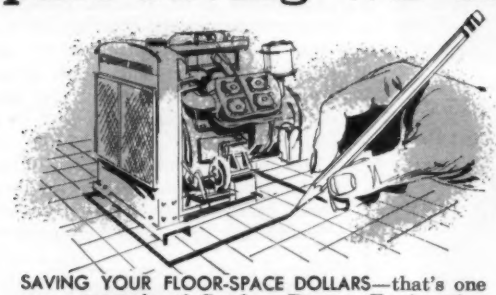
complete electrical connections. In addition to automatic operation, manual screwdriver or ball-type operators are standard on the solenoids. Valves also can be set to "locked in" or "locked out" position with the control. They can thus be cycled manually for ease of machine set-up etc. All of the valves are equipped with company's MAC solenoids which require no tools to assemble or disassemble; and all solenoids are interchangeable among valves of the same port size. "Add-a-unit" manifold type bases are available for ¼-in. models, permitting ganging of up to 10 valves with common inlet, exhaust and conduit channels. Mechanical Air Controls, Inc.

45—MOLD RELEASE OIL for improved die casting

This mold release oil is reported to have improved mold release properties which prevent adhesion of casting metal to die mold, give bright, stain-free casting surfaces, and produce die



Space-saving WB saves floor-space dollars



SAVING YOUR FLOOR-SPACE DOLLARS—that's one more example of Gardner-Denver Engineering Foresight. Our engineers know your problems . . . design equipment to meet your needs. At Gardner-Denver there's no substitute for men—our 100-year philosophy of growth.

What's the yearly overhead for a square foot of floor space in your plant? That will indicate one of the savings you can expect—year after year—when you install a compact Gardner-Denver WB air compressor. For example, the WBJ displaces 686 cfm—occupies only a 5½′ x 6¼′ corner of your plant.

There are eight space-saving WB sizes from 142 to 1150 cfm piston displacement. Each size is a packaged unit that's easily and quickly installed without costly foundation work.

Noted for years of dependable, economical service. And here's one important reason: our workmen keep the machine *clean* during assembly. Write for Bulletin WB-10, or consult your Gardner-Denver compressor specialist.

GARDNER-DENVER Since 1859 100 1959 YEARS

EQUIPMENT TODAY FOR THE CHALLENGE OF TOMORROW

GARDNER - DENVER

Gardner-Denver Company, Quincy, Illinois

In Canada: Gardner-Denver Company (Canada), Ltd., 14 Curity Avenue, Toronto 16, Ontario

For more facts circle 598 on Reply Card

Life in these excited states...

"I've chipped off all the rust, Chief, but don't the walls seem kind of thin?"

Corrosion makes profits thin, too

If corrosion and contamination are eating into your profit margin, you need chemical-resistant equipment by American Hard Rubber Company. Look today to see where you can use Ace rubber and plastic pipe, valves, pumps, tanks and special parts. It doesn't cost... it pays!

Ace chemical-resistant rubber-lined steel pipe best for high-pressure, big sizes, or abrasives. Pipe, fittings and valves 1½ to 24".

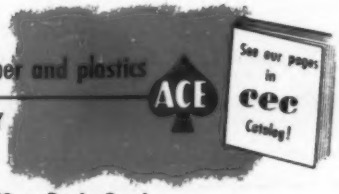
Highly efficient *WE* pump. Capacity to 360 gpm. Cast iron, fully protected by top quality, chemical resistant hard rubber lining.

Design assistance and facilities for molding special fittings, pump parts, etc., of plastics or hard rubber. Also large hand-fabricating facilities.

Variety and quality to match *any* plastic piping. Riviclor PVC, Ace-Ite rubber-plastic, Parian poly, Ace Saran, Tempron high temperature nitrile, hard rubber-lined steel.

ACE processing equipment of rubber and plastics

AMERICAN HARD RUBBER COMPANY
DIVISION OF AMERACE CORPORATION
Ace Road • Butler, New Jersey



For more facts circle 599 on Reply Card

NEW PRODUCTS

(Begins on page 156)

castings with less porosity. According to company, it develops comparatively less fog during die casting operations and gives excellent lubrication, which minimizes wear on guide pins and bushings. Improved results with less frequent application are reported for the spray-applied lubricant oil. Sun Oil Co.

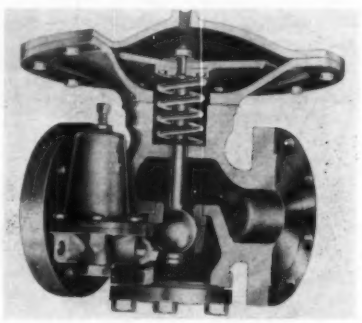
46—EXHAUST VENTILATOR has low silhouette design

Housing of this hooded exhaust ventilator is described as extremely low, yet having a 360-deg near horizontal discharge. Features include near hori-

zontal discharge to prevent roof damage; motor isolation mounts; integral base and fan inlet; hinged head on larger models; tubular motor bracket on larger models; venturi throat to decrease turbulence; and optional screens and safety disconnect switches. Standard construction is of heavy gage steel, but it is also available in aluminum or Fiberglas. Western Engineering & Mfg. Co.

47—PILOT VALVE for steam pressure reducing

The KP-4 is an external pilot operated steam pressure reducing valve design to meet requirements for most steam pressure reducing valve installations. Pressure adjustments are made by turning the adjusting screw on the pilot valve. Features include an AISI Type 440C stainless steel ball inner valve, described as perfectly spherical and hard, which closes against a Monel seat ring. This combination is



Why the simplest trapping method is also the most economical

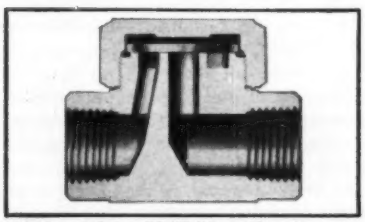
by John W. Ritter, Test Engineer
SARCO Company, Inc.

The function of all steam traps is to release condensate and prevent steam loss. However, the method of trapping can make a great difference in cost and effectiveness.

In the Sarco Thermo-Dynamic® Steam Trap, the method is fundamental. Air or condensate entering the trap must flow from the inlet tube, radially across the underside of the disc valve, to the outlet. The space between the inlet tube and the disc forms a nozzle in which the static pressure energy of the incoming fluid is partly changed to velocity across the underside of the disc, with a resultant *decrease* of pressure. (This will be recognized, of course, as the Bernoulli Principle.) Use of this fundamental method means reliability in operation.

As the high-velocity fluid jet strikes the side of the upper chamber, some recompression takes place, so that the pressure above the disc becomes greater than the pressure below it. The pressure reduction under the disc and the pressure recovery above it depend on the internal energy of the fluid. As the condensate above nearly approaches steam temperature, its internal energy is enough to overcome the upward force at the inlet tube, and the disc snaps down in the inlet tube, which is the inlet valve seat.

Simultaneously, the disc also seals the outer ring, which isolates the space above the disc from the outlet. The disc valve is therefore held firmly against the inlet valve seat until the pressure in the control chamber is reduced by condensation. The upward force then exceeds the downward force and the disc valve opens.



This 3-part Sarco TD-50 Steam Trap has only one moving part — the hardened, polished stainless steel disc.

No other trap uses the velocity of the fluid to operate the valve or the recompression of the flowing fluid to trap the valve closed and to hold it closed. When it closes, it closes tightly — no "operating steam" leaks out.

This tracer line manifold at the Armour Chemical plant at McCook, Illinois, is drained by eleven Sarco TD-50 Steam Traps.

Test installation led to selection of SARCO TD-50 Steam Traps at Armour's McCook Plant

Test installations of Sarco Thermo-Dynamic® Steam Traps at the McCook, Illinois, plant of the Armour Chemical Division showed satisfactory performance on all requirements specified by the plant engineers. The TD-50's discharged condensate as fast as it formed, without wasting live steam. TD's inline construction made installation easy, even in tight quarters. Maintenance was practically negligible, and no adjustment was necessary for varying steam pressures. In the plant, steam pressure of different processes ranges from 15 to 160 psi. Armour's McCook plant began to install TD-50 Steam Traps in 1956 and continued to add them as the plant expanded. By the third quarter of 1958, there were 309 TD-50's in use there.

Write for your "Literature Kit 2A" today and get latest bulletins on the TD-50 Steam Trap and other Sarco traps. Sarco can give you impartial advice on *Production Planned* steam trapping because . . .

7961-B

SARCO
COMPANY, INC.
635 Madison Ave., New York 22, N. Y.

Only Sarco makes all 5 types:
Thermo-Dynamic • Thermostatic • Liquid Expansion*
Float Thermostatic • Bucket

*U. S. Pat. No. 2,817,353 T.M. Reg. U. S. Pat. Off.

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

For more facts circle 600 on Reply Card

Mixing something? If it's a fluid, there's no faster, surer way to mix it than with a LIGHTNIN Mixer.

The unit shown gives the batch a powerful tumbling-rotating motion to create uniformity in shortest possible time and hold it indefinitely. This is one of 30 standard portable models. You can get permanently mounted types, too, for mixing any fluids in any container up to and including a six-million-gallon tank.

You never have to worry about results when you mix with a LIGHTNIN Mixer. It is guaranteed, unconditionally, to do the job. It requires very little servicing (hundreds have been running for 20 years and more). It is built of standard interchangeable components, so replacement parts are always in stock.

For quick, competent help on fluid mixing of any kind, call in your LIGHTNIN Mixer representative. His name is in Thomas' Register. Or write us direct.

One of 30 standard LIGHTNIN Portable Mixers available in sizes from ⅛ to 3 hp.

Send catalog information on:
- ☐ Portable mixers
- ☐ Top-entering mixers
- ☐ Side-entering mixers
- ☐ All types

"Lightnin' Mixers"
MIXCO fluid mixing specialists

Check, clip, and mail with your name, title, company address to:

MIXING EQUIPMENT Co., Inc., 144-n Mt. Read Blvd., Rochester 3, N. Y.
In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.

For more facts circle 601 on Reply Card

NEW PRODUCTS

(Begins on page 156)

designed to withstand the wire-drawing effects of steam indefinitely. Large main valve diaphragm is stainless steel to permit use with higher pressures and temperatures. Available with bronze, semi-steel or cast steel body, valve comes in sizes from ¾ to 4 in. Klipfel Valves, Inc.

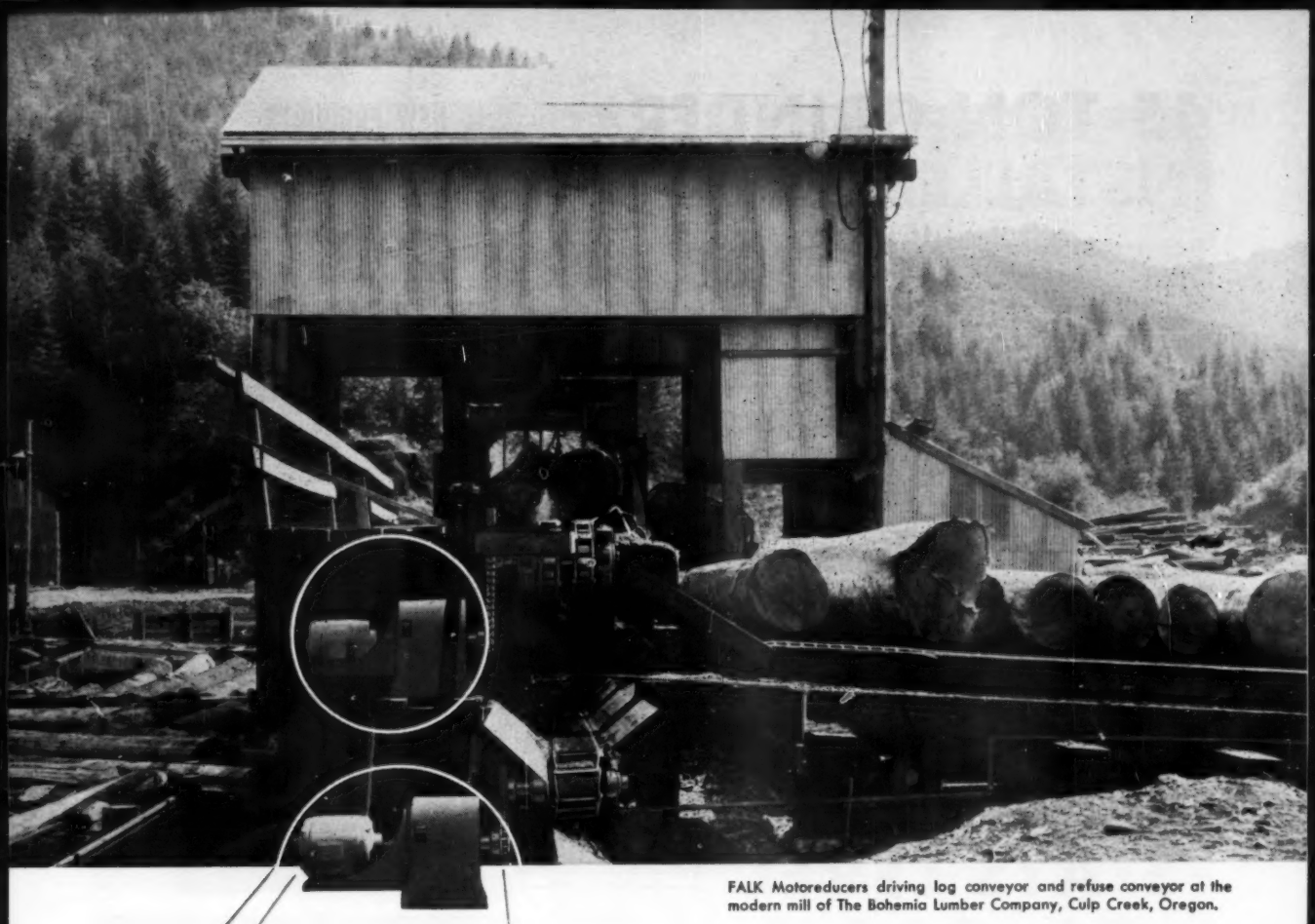
48—ANNUNCIATOR is economical solid state unit

The Panastat is described as an economical, solid state, miniature, low-drain, intrinsically safe and easily expandable annunciator providing information and control of industrial process systems. Longer life and decreased maintenance are attributed to elimination of moving parts, all operational

functions being performed by highly derated solid state elements. Low energy control circuits and negligible inductance provide intrinsic safety, it is stated, and ignition in hazardous atmospheres is impossible because no arc can be sustained. Manufacturer says that Class I, Div. II requirements are exceeded; there are no make or break contacts. The annunciator operates on standard a-c or d-c line voltages. Lamps are interchangeable with existing annunciators and models of this system can be readily expanded due to interchangeable plug-in units. The miniature annunciator can be had to fit a 5-by-5 in., 6-by-6 in. standard pneumatic or electronic instrument case or standard annunciator cabinet. Panellit, Inc.

49—WHEEL DRESSERS keep grinding heat low

Economy Grinding Wheel Dressers are designed to increase grinding efficiency by lowering grinding heat at area of contact. Small, elongated diamonds are mounted in a steel matrix which has the same coefficient of expansion as the diamond and bonds



FALK Motoreducers driving log conveyor and refuse conveyor at the modern mill of The Bohemia Lumber Company, Culp Creek, Oregon.

FALK *all-steel* Motoreducers give you longer service life

Whether your load conditions are normal or heavy, the extra rigidity of all-steel construction (more than twice that of cast iron) maintains better alignment of revolving elements under load...a vital factor in prolonging the service life of gears and bearings.

And if your installations are subject to shock loads, or accidental external impacts, you're way ahead when you install Falk All-Steel Motoreducers. These rugged units do not destroy themselves by tearing off their feet under jamming overloads, nor are their housings subject to cracks which both dissipate the vital lubricant supply and allow revolving elements to get out of alignment.

All-steel construction is one of the built-in extras that you get in Falk Motoreducers. Others include: (1) 12 to 15% reserve load-carrying capacity in the gears (by AGMA standards), thanks to exclusive Falk extra-depth, high pressure angle helical gears; (2) maximum mechanical efficiency (98½% per gear mesh, under full load); (3) your choice of standard units (horizontal, vertical or right angle) to fit your precise requirements.

HORSEPOWER RANGE: to 75 hp . . . STANDARD OUTPUT SPEEDS: 780 rpm (high) to 1.2 rpm (low).

Prompt delivery from distributor stocks, or from warehouse or factory. Ask your Falk Representative or Authorized Falk Distributor for ***Bulletin 3100.***

THE FALK CORPORATION, MILWAUKEE 1, WIS.

MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

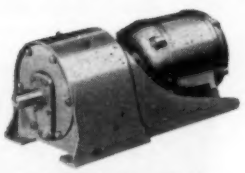
Representatives and Distributors in most principal cities

For more facts circle 602 on Reply Card

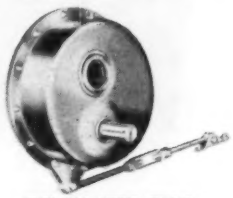
FALK

...a good name in industry

Take your choice of all-steel drives when you specify Falk



THE FALK ALL-MOTOR MOTOREDUCER
...the original All-Motor unit



THE ALL-STEEL FALK SHAFT MOUNTED DRIVE

Torque ratings to 41,000 lb-in at low speed shaft. Also available in flange-mount design.

FALK and ALL-MOTOR are Registered Trademarks.

45-TON GRINDER INSTALLED ON Air-Loc

Insert shows use of Air-Loc and leveling plates. No bolts or cement needed.

STAYS LEVEL TO .0005"

This Norton Grinder, installed on 26 AIR-LOC mounts, is regularly checked for level at 3-month intervals . . . and always holds the .0005" level required by manufacturer's specifications, with no adjustments necessary.

Jigborers, grinders, lathes . . . all of your fine tolerance precision machines . . . should be installed on AIR-LOC to safeguard the accuracy originally built into them by the manufacturers.

Air-Loc 4·17·4

You get a permanent precision installation with patented AIR-LOC mounts that *Resist* oil, water and alkali, *Permit* easy leveling, *Eliminate* need for bolts or cement, *Hold* machines in place, *Reduce* transmitted vibration from the floor.

Return Coupon for Air-Loc Samples and Booklet.

AIR-LOC DIVISION
Clark-Cutler-McDermott Company
Franklin, Massachusetts

NAME ..... TITLE .....
(Please Print)
COMPANY .....
ADDRESS .....
CITY ..... ZONE ..... STATE .....

For more facts circle 603 on Reply Card

NEW PRODUCTS

(Begins on page 156)

to it. Shape and mounting of the diamond are said to keep dresser sharp over its entire life. According to company these dressers never require resetting and a few standard dressing tools can be used on several machines. Precision Diamond Tool Co.

50—FLUID FILTER with in-line style housing

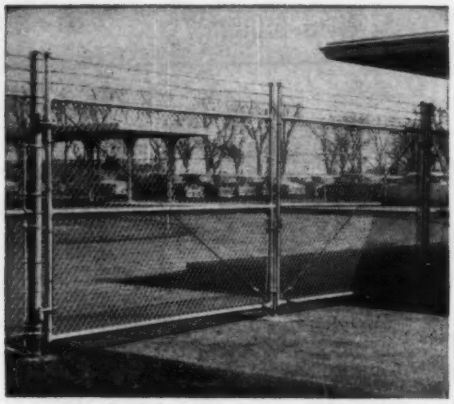
The Tell-Tale In-Line is a high pressure fluid filter designed to indicate when the element needs cleaning. It is for use with pressures up to 2000 psi, and with any of seven available filter

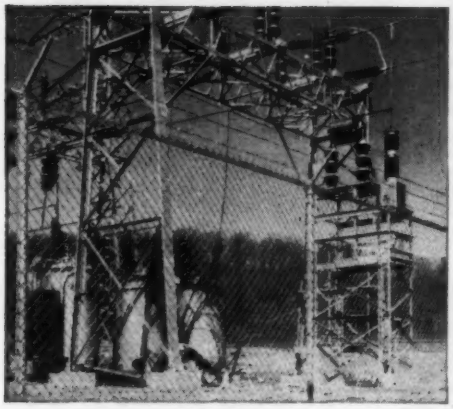
mediums having openings from 238 down to 10 microns. A typical flow rating with a 149-micron element at 1 psi pressure drop is 20 gpm. Easy access to filter cartridge, full-flow filtering, adjustable maximum pressure drop control and full by-pass are features announced. The housing will also permit use of suitable flow meter to spot check flow rates. The Rosaen Co.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 215-216.

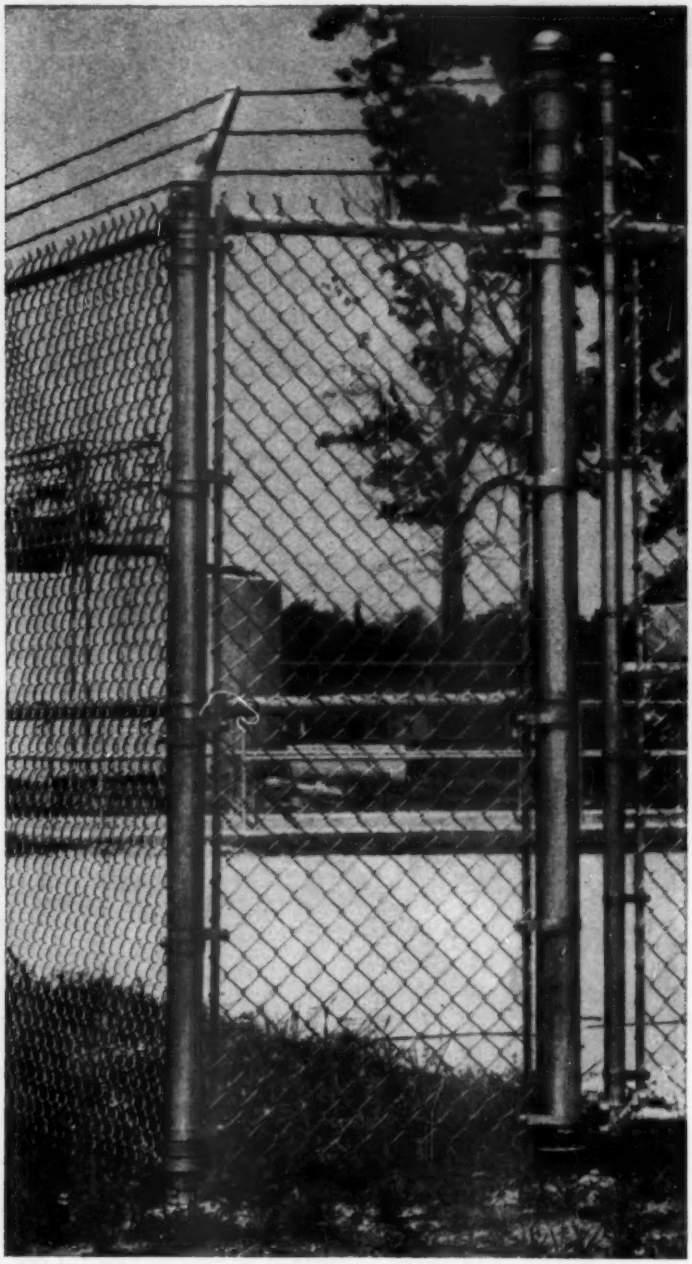
51—ENCLOSED SWITCHES in two actuator versions

One-way roller arm actuators that provide electrical actuation in one direction only are available for either side and bottom mounting. They are designed for use with machine tools employing a slide to actuate switch and override it, but not actuate it on the return stroke. A sealed plunger protects actuating mechanism and switching unit from dirt and splashing liquids. Also available are side and bottom enclosed switches that feature a low force 6-in. rod actuator, for





with Aluminum THIS FENCE IS MAINTENANCE-FREE!



Chain Link Fencing of Alcoa Aluminum Needs No Protective Painting

Because aluminum supplies its own protection against highly corrosive industrial elements, applications throughout the years have proven advantages more than skin deep. Alcoa® Aluminum alloys age to a pleasing shade of gray and need no painting to preserve appearance or strength.

The superior combination of durability and appearance in chain link fencing of Alcoa Aluminum is evidenced in installations over 30 years old. Alcoa Aluminum consistently outlasts conventional installations . . . with an absence of maintenance cost.

Check these other advantages you get with Alcoa Aluminum:

High Strength—Average tensile strength of Alcoa's new alloy is 57,500 psi.

Easy Erection—Light weight means less labor.

Readily Available—Reliable manufacturers and erectors in 48 states. Contact your nearest Alcoa sales office.

For your copy of 12-page illustrated booklet and a summary of recently bid prices on 4-ft-high and 6-ft-high all-aluminum fencing, write to Aluminum Company of America, 2057-M Alcoa Building, Pittsburgh 19, Pa.

ALCOA ALUMINUM

Your Guide is the Best in Aluminum Value

For Exciting Drama Watch "Alcoa Theatre," Alternate Mondays, NBC-TV, and "Alcoa Presents," Every Tuesday, ABC-TV

For more facts circle 604 on Reply Card

Industry Wide...

CONNOR ENGINEERING CORPORATION

dorex® PURIFIES AIR TO PROTECT PERSONNEL and EQUIPMENT

Like the P. H. Glatfelter Paper Co., many manufacturers who use expensive, sensitive production equipment can't afford to risk its damage by destructive atmospheric pollutants.

At Glatfelter, for instance, 78 soundly engineered Dorex Type C-42 Air Purification Cells decontaminate intake air to protect personnel and sensitive electrical equipment against the heavy concentrations of chlorine gas unavoidably caused by certain production processes.

Offering great arrangement flexibility (shown here installed in one central location), Dorex is the most practicable, effective, economical method yet developed to meet every demand for proper air purification. Dorex acts just like a gas mask . . . using activated carbon to adsorb air entrained impurities. This adsorbing action purifies contaminated air and readies it for safe, sanitary re-use in air conditioning systems. And Dorex is designed in various type C-Cells and Canisters to provide economically the optimum purification required by the degree of air contamination involved.

Additionally, Dorex offers a systematic replacement service which ensures your system's continuous operation. Request new Dorex Bulletin 108A—it fully describes how Dorex equipment and service can benefit *you*.

CONNOR... for Constant Comfort Conditions

CONNOR ENGINEERING CORPORATION

dorex® air recovery

CONNOR ENGINEERING CORPORATION

DANBURY • CONNECTICUT

For more facts circle 605 on Reply Card

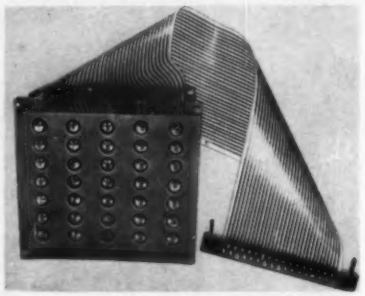
NEW PRODUCTS

(Begins on page 156)

use with counters, conveyors and sorting devices. Both actuator types are available in 15 amp, 120, 240 or 480 v a-c; ½ amp, 125 v a-c; ¼ amp, 250 v a-c. Micro Switch Div., Minneapolis-Honeywell Regulator Co.

52—PRINTED CIRCUITS are flexible, economical

Flexibility and all previous advantages of printed circuits are announced for Flexprint. Flexprint wiring is made by sandwiching thin copper conductors



between insulating layers of flexible plastic sheeting—in most cases Krene vinyl sheeting produced by United Carbide Plastics Co. The resulting flexible circuit simplifies the design of electronic and electrical systems, since it can be easily routed through crowded layouts. Low initial costs and faster, more accurate wiring are claimed for Flexprint Circuits, and inertness of plastic suggests use under corrosive conditions. Sanders Associates, Inc.

53—EPOXY ADHESIVE cures at room-temperature

Bondmaster M685, is described as a 100 per cent solids, unfilled, modified epoxy adhesive, formulated to permit pricing at a half to a third the cost-per-gallon normally associated with similar products of same chemical family. The two-part, room-temperature-curing formulation was developed for bonding of rigid expanded polystyrene to metal, wood and other rigid surfaces where operating temperatures are above 120 F, or other service conditions rule out conventional solvent-dispersed rubber-resin formulations. Tests are reported to indicate applicability for economical metal-to-metal and metal-to-plastic "general purpose" bonding where strengths of the epoxy order are called for—as in sandwich panel construction.

A free-flowing liquid (3000 to 7000 cps), intermediate strength, clear pale amber, two-component, modified ep-

PAYMENTS OUT OF SAVINGS

Let General Electric Capacitors Pay for Themselves

Now you can realize the benefits of capacitors without tying up working capital or your credit line. General Electric's new Time Purchase Plan allows you to take full advantage of the power-bill savings that G-E capacitors make possible. You can use the money that capacitors save in reduced power costs, released system capacity, improved voltage levels, and reduced power losses to make the monthly payments provided for by the plan. You pay as you save.

Check these General Electric Time Purchase Plan benefits . . .

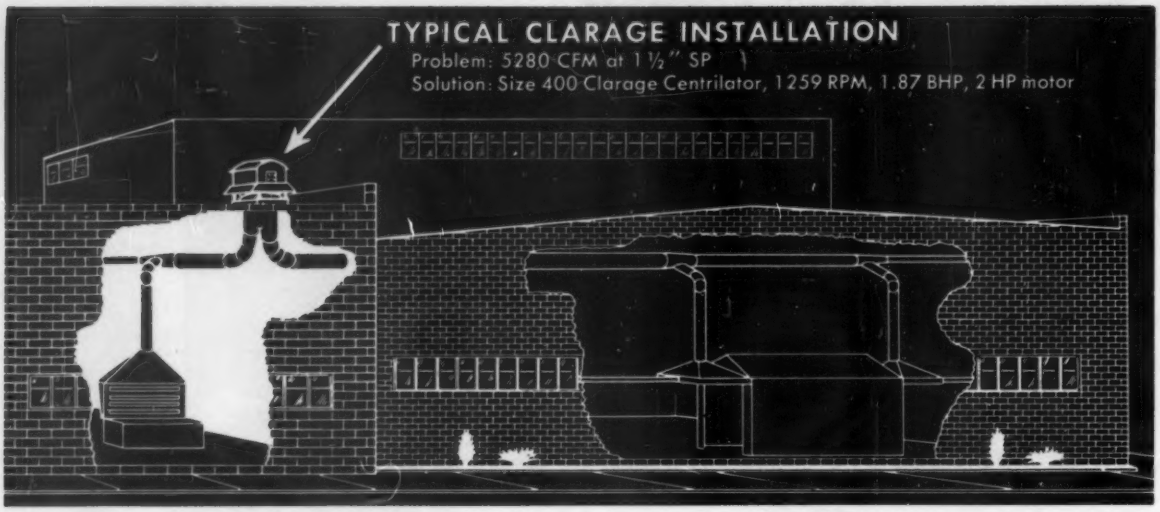
- You can purchase capacitors on a monthly basis . . . it's easy and convenient.
- Your working capital and credit line remain intact.
- You can purchase additional General Electric capacitor units and equipments by simply amending the original contract.

Find out how your capacitors can pay for themselves. Let your General Electric sales representative recommend a Time Purchase program suited to your needs. He'll be glad to help you. Contact your nearest Apparatus Sales Office, or write Section 446-8, Schenectady 5, N. Y.

Progress Is Our Most Important Product

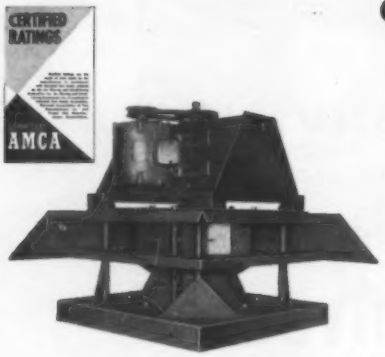
GENERAL ELECTRIC

For more facts circle 606 on Reply Card


TYPICAL CLARAGE INSTALLATION
Problem: 5280 CFM at 1½" SP
Solution: Size 400 Clarage Centrilator, 1259 RPM, 1.87 BHP, 2 HP motor

Demonstrating...

how to save space and money on your next air handling jobs



V-belt driven centrifugal type with backwardly inclined blade wheel. 10 sizes. Capacities from 1,500 to 26,500 CFM. (Shown above with weather enclosure and two sides of air apron removed.)

YOURS...ALL YOURS...with the Clarage Centrilator®* power roof ventilator. Handles static resistances to 2". Requires no floor space. Minimum installation cost. Unequalled accessibility. High efficiency for low operating cost. Ideal solution for numerous industrial systems such as the one shown above.

Get full information on the Clarage Centrilator and its exclusive Jet Siphon™ Air Flow Director feature. Request Bulletin 550 or contact the nearest of our 58 sales engineering offices today. CLARAGE FAN COMPANY.

* Patent applied for

Dependable equipment for making air your servant

CLARAGE

Kalamazoo, Michigan

For more facts circle 607 on Reply Card

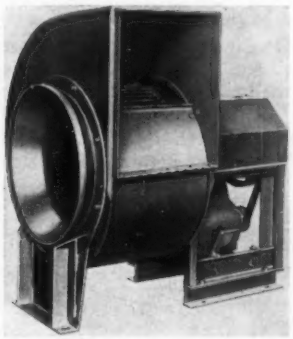
NEW PRODUCTS

(Begins on page 156)

oxy adhesive, Bondmaster M685 has a mixed weight, with hardener, of about 9.6 lb per gallon. Pot life with Hardener CH-22 is about 60 to 90 min; with Hardener CH-34, 45 min, depending on batch size and container depth. At room temperature, the bonded assembly can be handled in 6 to 8 hr and develops 85 per cent of maximum strength in 14 to 24 hr, manufacturer states. With suitable hardener material may be heat cured at 250 F in 10 min. Rubber & Asbestos Corp.

54—UNIT FANS are B-belt driven, ready-to-run

These ready-to-run units are furnished complete with motor and drive integrated in one assembly. They are claimed ideally suited to supply or exhaust jobs—indoors or outdoors—for volumes to 25,000 cfm, static pressure through 2½ in., and temperatures to 300 F. Type LS Ready Units have low speed, forward curved multiblade wheels and are offered in 13 sizes; Type MS have medium speed backward inclined blade wheels and come in 12 sizes. Clarage Fan Co.



55—FLOORING resists corrosion, looks attractive

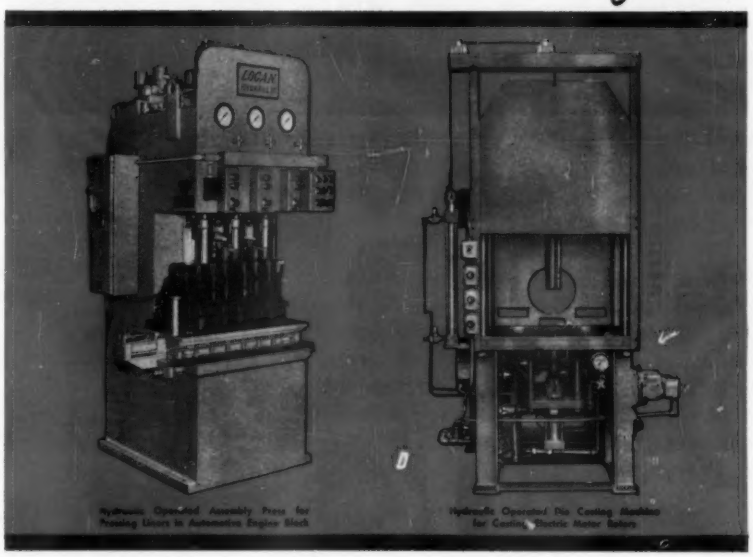
Corocrete Terrazzo Flooring is said to combine the beauty of terrazzo floors with extreme corrosion resistance and high strength. According to company, the material is "flexibilized" to afford maximum resistance to thermal shock and impact. It is recommended for installation where attractive appearance must be combined with chemical resistance to acids, alkalies, oils, solvents, cleaning agents and other chemicals. Terrazzo effect is obtained through use of silica chips where maximum corrosion resistance is required or marble chips for less severe corrosive conditions. Application is by trowel or other cement finishing tools. Physical properties include tensile strength of 1800 psi, compressive strength of 9200 psi. The Ceilcote Co.

56—TABLE CONVEYOR speeds assembly operations

The Table-Cable Conveyor is designed for handling a variety of products through assembly at work-table heights. The conveyor is composed of free-running four-wheel trolleys bolted to Bush-Lock cable with standard blocks for low friction operation on the angle tracks. Pallets or fixtures are then secured to the trolleys as required. Included in the selection of components are a variety of turns, such as the corner turn, with cable sheave and rider plate, which gives change of direction from 90 to 180 deg, the take-up turn and the drive

BE SURE!

Look to Logan



when you require special air or hydraulic-operated equipment for PRESSING • STAKING • FORCING CASTING • FORMING • SIZING

For more than forty years Logan's special services department has engineered and built special equipment to industry's exacting requirements. Logan engineers are always available to help you with your special applications.

for further details ask for bulletin 7-A

LOGANSPORT MACHINE CO., INC.

838 CENTER AVENUE, LOGANSPORT, INDIANA

Logan

MEMBER: Natl. Mach. Tool Builders' Assn.; Natl. Fluid Power Assn.

For more facts circle 608 on Reply Card

NEW PRODUCTS

(Begins on page 156)

turn. By using inclines and hold-down angles, loads can be carried to various table elevations. E. W. Buschman Co.

57—INFRA-RED HEATERS offer operating economy

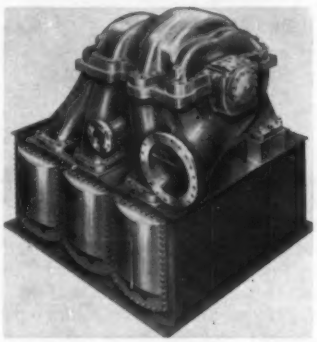
Hard-to-heat buildings can be economically maintained at controlled temperatures with these gas-fired infra-red heaters, says manufacturer. Outputs range from 12,000 to 48,000

Btu/hr. The thermostat-controlled heaters are claimed particularly useful for heating high-ceilinged buildings—even large monitor and saw-toothed roofed areas—without ducts, blowers or heat exchangers. Fuel costs in space heating installations are reduced at least 30 per cent, it is stated; electrical power costs for the heating system are reduced as much as 97 per cent, and maintenance costs minimized.

In these heaters, infra-red rays are produced by burning a gas and air mixture on the surface of a ceramic element; heat is radiated from this ceramic surface which glows at a temperature of 1600 F. Individual burners—rayheads—combined with controls, ignition system, casing and aluminum reflectors make up a heater unit. For general use parabolic sided reflector units can be mounted at heights up to 45 ft, since the reflector concentrates and directs the rays. Straight side reflectors, recommended for 10- to 20-ft heights, provide a spread pattern of radiation. Perfection Industries, Div., Hupp Corp.

58—CENTRIFUGAL COMPRESSOR supplies 100-lb air

The H Line of high efficiency, multi-stage centrifugal air compressors is designed to furnish 100-lb air for centralized air systems and other industrial air applications. It features integral intercoolers between each stage of



compression for highest possible efficiency. Six case sizes are available with horsepowers ranging from 1000 to 8000 bhp and capacities from 5000 to 38,000 cfm. Each unit is furnished as a complete package including matching driver, intercoolers and lubricating system. In addition to high efficiency, it features single-case construction which cuts floor space requirements, bearing supports cast integral with the case, back-to-back impeller design. Clark Bros. Co.

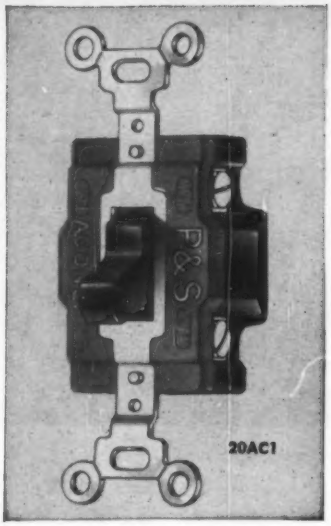
59—EPOXY REPAIR KIT for "on the spot" jobs

Carbo Fix is a two-component, fast setting, epoxy material that is said to cure to a hard, tough, tightly bonded patch, restoring damaged or broken

SPECIFIED
FOR RUGGED DUTY

OVER AND OVER AND OVER AGAIN

P&S
SUPER
AC
SWITCHES



- Extra large terminal screws.
- Back or side wired.
- Extra large silver buttons.
- Can be used to *full rated capacity* on inductive loads.
- Heavy plastic body.
- Contacts in upright position mounted at point of least vibration.
- Available in 15 and 20 Amp. types.

Send for complete catalog, Dept. PE-1259.

P&S
PASS & SEYMOUR, INC.
SYRACUSE 9, NEW YORK
60 E. 42nd St., New York 17, N. Y. 1440 N. Pulaski Rd., Chicago 51, Ill.
In Canada: Renfrew Electric Co., Ltd., Toronto, Ontario

MAKE THE COMPLETE JOB COMPLETELY P&S
For more facts circle 609 on Reply Card

Steel and aluminum users report increased values from Ryerson

These case histories—selected at random from our files, provide additional evidence that you consistently get increased value for your purchasing dollar from Ryerson. Individual points of difference between Ryerson and other sources may not by themselves seem overwhelming—but in total they add up to an important difference in dependability, experience and capacity to serve.

A world famous manufacturer formerly tested all steel purchased from steel-service centers for critical ordnance work. But, often, test costs on small lots of steel were greater than material costs. So the company decided to concentrate its purchases with sources proved completely reliable —and discontinue its own testing. Experience showed that the required certifications of quality were always absolutely dependable in the case of only three steel suppliers—among them Ryerson where quality has been a watchword since 1842.

Milling operation eliminated. A structural fabricator followed the usual practice of milling the ends of beams to be used as column bases until he discovered the accuracy and squareness of Ryerson friction sawing. Now he has eliminated the milling operation because, at no extra cost, Ryerson can guarantee friction saw accuracy of only ± 1/16″ for beams up to 6″ and ± ⅛″ for sections over 6″ —squareness tolerances of .010″ per inch of section.

Better product appearance and a worthwhile saving in material cost resulted when a Ryerson man recommended that a producer of portable coolers switch from one aluminum alloy (3003-H14) to another (5005-H14). Slightly higher structural strength was a bonus value. Unusually broad aluminum stocks and technical resources often enable Ryerson to serve in this way.

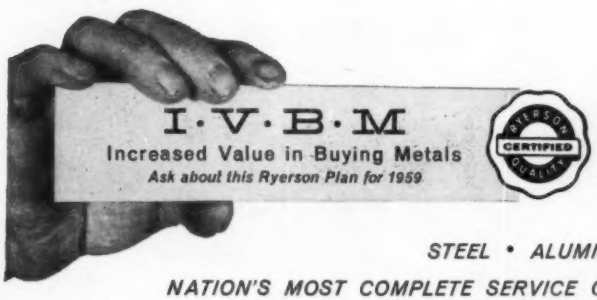
The need was urgent. A breakdown was cutting output of a big paint producer, and the steel needed to repair the break was not available in the area. However, the required analyses and size *was* on hand at the nearest Ryerson plant 200 miles away —and within an hour Ryerson delivered 100′ of this bar stock to the local airport. Three and a half hours after calling Ryerson in another state, the customer had his steel.

"Deeper cut, better finish, longer tool life, and lower total per-piece cost." These were the results reported by a Mass. machining company after it switched to Ryerson Rycut® 40 alloy steel for shafts, gears and spindles used in rugged machine tools. Ryerson Rycut steels are the world's fastest machining in their carbon ranges.

Missile component problem solved. Titanium stringers in stainless forged bars were creating a high reject rate for a missile parts manufacturer. His Ryerson specialist recommended a switch from Type 321 stainless to Type 347. Results: the same stabilized corrosion-resistance and strength—but no titanium stringers.

Furniture manufacturer saves 15¢ per unit on every chair produced. A *rolled* aluminum angle was being used where strength was not an important factor. A Ryerson aluminum specialist suggested an *extruded* angle which gave all the strength needed in the application, was more easily formed, had better appearance—and reduced costs as well.

These are just a few examples that illustrate the advantages that make Ryerson service truly unique. A call to your Ryerson representative may solve similar problems for you.



RYERSON STEEL®

Joseph T. Ryerson & Son, Inc., Member of the INLAND Steel Family

STEEL • ALUMINUM • PLASTICS • METALWORKING MACHINERY

NATION'S MOST COMPLETE SERVICE CENTERS IN PRINCIPAL CITIES COAST TO COAST

For more facts circle 610 on Reply Card

NEW PRODUCTS

(Begins on page 156)

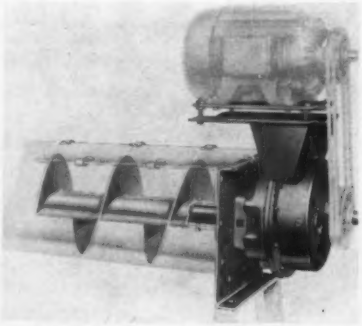
piece to its original condition. Repairs can be made to equipment, pipes, tanks, valves, fixtures, machinery, gutters, plumbing. Two types are available—Carbo Fix S for general repair to most surfaces, including glass, and Carbo Fix C, recommended where chemical attack is of major consideration. Each kit contains a jar of resin, a jar of catalyst, fiber glass cloth, measuring spoons, stirring paddle and instruction booklet. Carboline Co.

60—12-IN. RECORDER for temperature or pressure

Up to four recording pens can be provided on this 12-in. recorder, for temperature, pressure, or a combination of the two variables. Filled-system thermometer elements are designed to measure temperatures from —300 to 1200 F (fills include mercury, vapor, gas, and organic liquid). According to company, pressures from 30 in. of mercury vacuum to 25,000 psi can be recorded (elements include spiral, bellows, C type Bourdon tube). Recorder features improved case with recessed bottom that permits one type of connection for both wall or panel mounting, and an extra large opening in door. U. S. Gauge, Div. American Machine & Metals, Inc.

61—HELICAL GEAR DRIVE for screw conveyors

This compact helical gear drive, designed especially for screw conveyor installations, comes in six sizes, with ratios of 4:1, 9:1, 14:1 and 24:1, for all conveyors requiring ½ to 30 hp. Drive shafts are removable, by means of a snap ring arrangement, and on many applications can be removed without disturbing reducer or screw. Trough ends, available in eight sizes from 6 to 20 in., bolt to standard troughs. Choice of seals (waste packing, felt seal, or lip seal, either leather or Neoprene) is offered between conveyor and reducer. The basic drive can be combined with standard trough end or with company's motor mount. The Falk Corp.



62—CENTRIFUGAL SEPARATORS are self-opening type

Model PX Self-Opening Centrifugal Separators are designed for continuous processing of liquid mixtures having high solids content. The line consists of three models: PX 207, with a capacity range of 200 to 1500 gph; PX 309 of 400 to 3000 gph; and PX 213 of 1000 to 6000 gph. Specific capacity depends upon type feed and solids content involved. Units are used primarily in operations where amount of solids present would quickly fill up bowl of standard separators, where there is insufficient feed to use nozzle bowl separators, or where high concentration of solids discharge is required. Solids build up along bowl wall, but when predetermined amount is reached, a series of apertures on bowl wall are exposed and solids are ejected while bowl is operating at full speed. Solids discharge cycle takes a few seconds, according to manufacturer, and eliminates manual bowl cleaning. The De Laval Separator Co.

HOW YOU MAY CUT YOUR MACHINE FAILURES BY AS MUCH AS 25%

by J. R. RATCHFORD, Specialist, Lightning Arresters and Cutout Marketing

Experience shows that 25% of failures of unprotected rotating machinery are due to lightning.

With percentages like that against you, lightning and surge protection is imperative. The cost of this protection is a small fraction of the a-c motor or generator investment, and can be as low as 1/100th the cost of only one large a-c machinery repair. General Electric lightning protective equipment is available for all ratings of a-c machine operating voltages.

The Pyranol* protective capacitors in the G-E system provide turn-to-turn insulation protection by reducing the steepness of applied lightning surges and reflections within multi-turn machine windings. The Thyrite* Magne-valve station-class arresters protect the major (line to ground) insulation by limiting the magnitude of incident and reflected surges on the windings. Used in parallel, this combination effectively combats lightning-caused machine downtime and resulting repair costs.

May we show you specifically how you can protect your a-c rotating machinery? Contact your General Electric representative for full details or write to Sect. 435-24, General Electric Co., Schenectady 5, N. Y.

* Registered Trademark of the General Electric Company.

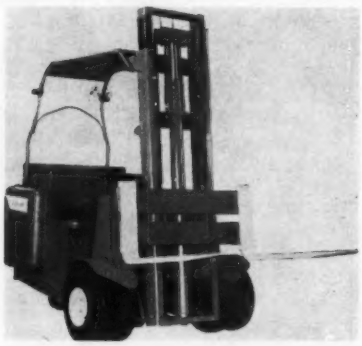
GENERAL ELECTRIC

General Electric Capacitor-

Use the Reader Service Cards provided on pages 215-216 to ask for more information on these products. Circle item numbers of those in which you are interested.

63—OUTDOOR FORK LIFT is quick, maneuverable

The Hustler Outdoorsman, a dual pneumatic electric truck for outside work, has a battery capacity of 720



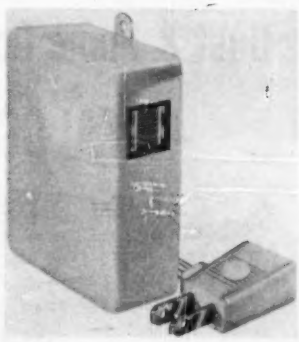
amp-hr and is designed to handle 2000-lb loads over an 8-hr shift on rough terrain. Features announced include low seating and ease of operation. It has four speeds forward and reverse. Also reported are excellent adaptability to indoor-outdoor work, and all of the safety and maintenance advantages of an electric truck. The Heifred Corp.

64—BALL VALVES made of rigid vinyl material

Successful use of rigid vinyl ball valves in piping systems where corrosion is a problem is announced by this manufacturer. Except for seats and seals, the valves are made of Geon, a vinyl material said to offer superior resistance to oils, acids, alkalies and most chemicals. Available with threaded ends, weld ends or flanges, the vinyl valves are self-compensating for changes in pressure or temperature. There is no problem of galling or seizure, company says, and no lubrication is needed. Jamesbury Corp.

65—AUTOMATIC SWITCH turns lights on and off

Protect-O-Lite is an automatic switch activated by presence or absence of light. Turns on electric power or lights at night and off at dawn. The "silent watchman" is designed to discourage burglars, prowlers and vandalism, and to prevent accidents in the dark. The unit is simply plugged into power outlet with the photo electric eye facing the outside natural light. It comes

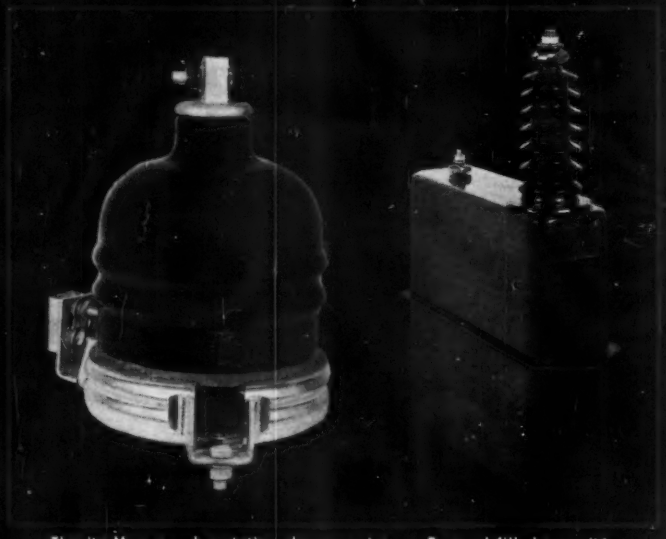


complete with 6-ft cord and plug, for 110-125 v a-c with 600-w capacity. Energy Kontrols, Inc.

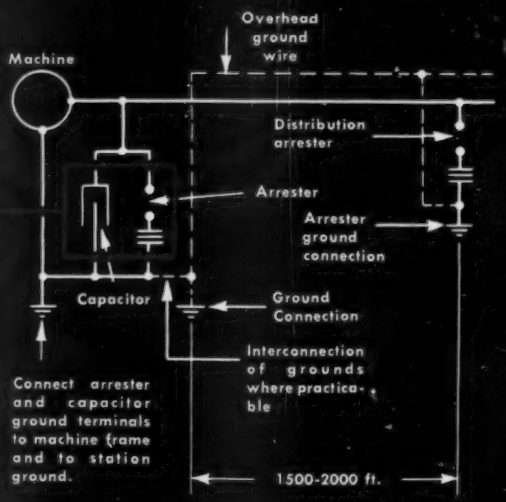
66—SHEET FEEDER has an elevating drive

Incorporating a ball bearing screw operating through a chain and sprocket drive, Steelmobile Senior Trucks, offer a wide range of sizes and capacities for sheet feeding operations and similar applications requiring a broad elevating top combined with porta-

Arrester Combination Gives You Low-Cost Lightning and Surge Protection for Your High Investment in A-C Rotating Machines



Thyrite Magne-valve station-class arrester Pyranol filled capacitor



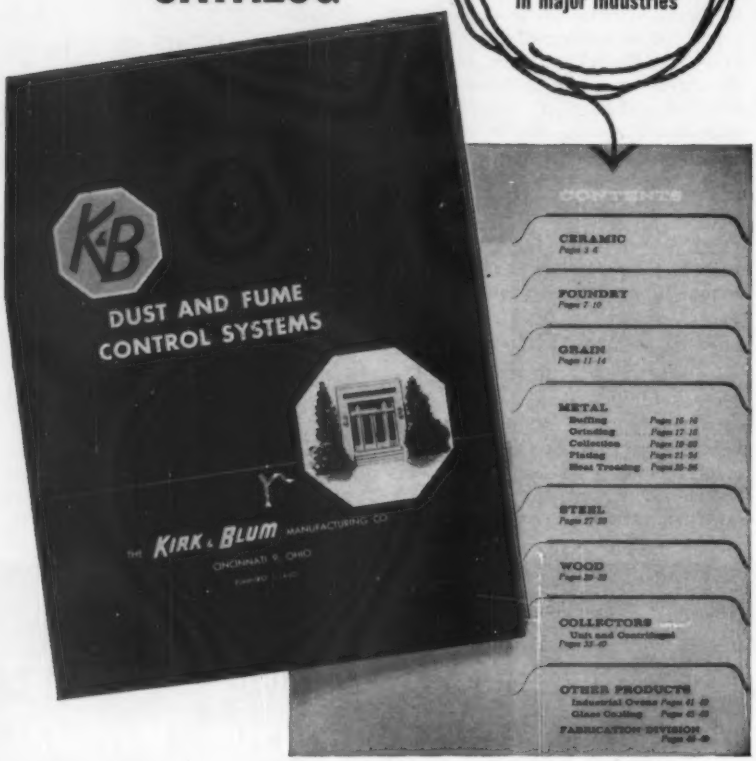
Typical scheme of protection for machines connected directly to exposed overhead lines

GENERAL ELECTRIC

NEW KIRK & BLUM

Dust & Fume Control CATALOG

52 pages showing 60 different installations in major industries



See how Kirk & Blum engineers the best suited dust and fume control system for each particular application.

See how Kirk & Blum provides one source for the complete operating system—design, fabrication, installation—*one* undivided responsibility.

Clip and send coupon below for your copy.

THE KIRK & BLUM MANUFACTURING CO. 3189 Forrer St., Cincinnati 9, Ohio

Please send me Dust & Fume Control Catalog.

Name_____ Title_____

Firm_____

Address_____

City_____ Zone____ State_____

For more facts circle 612 on Reply Card

NEW PRODUCTS

(Begins on page 156)

bility. Capacities range from 4000 to 10,000 lb. Top sizes can be had from 24-by-96 in. to 36-by-144 in. Elevating range is nominally 24 in. minimum height to 40 in. maximum. Elevating effort is derived from a two-speed gearbox, crank driven and self-locking to prevent load drift. Structural features include tubular steel framing, four swivel casters and two centered wheels. Four bolts attach gearbox to the frame as a unit; this offers users the later option of installing an electric drive package when available. Jarke Mfg. Co.

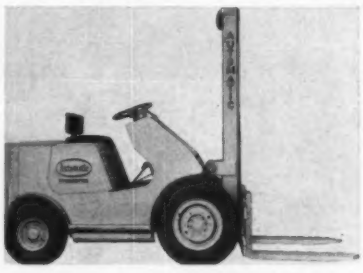
67—PORTABLE STAND with tool storage drawers

Designed as heavy duty "machine tenders," these portable stands have locking drawers which offer low cost

protection against dirt, pilferage and unauthorized borrowing of tools, gages etc. Of steel with forest green enamel finish, the stands come in 18-by-30 or 24-by-36 in. tray sizes, are 34 in. high and have four 2½-in. swivel casters. Bay Products Div.

68—FORK TRUCK is pneumatic-tired, gas-powered

The Dynamotive is a pneumatic-tired gas-powered, electric-driven fork truck designed to provide optimum torque output at a lower rpm requirement. The gasoline engine transmits power through a specially designed variable voltage generator to a matched d-c



VERSATILE PLANT DUTIES: Sorting, loading, fabricating, erecting—this 300 series self-propelled crane (above) performs all kinds of jobs that demand precise load control. Left: An American DiesELectric Crane performs the dual work of loading and switching rail cars.

ON RAIL, ON GROUND—AMERICAN CRANES PRODUCE FAST, POWERFUL MATERIALS HANDLING SERVICE

Looking for the most efficient answer to your heavy-duty lifting and loading demands? Here it is: American Cranes, either on rail, rubber, or crawler. American Truck, Self-propelled and Crawler Cranes . . . capacities from 12½ to 60 tons . . . will meet all your requirements for mobility and speed. Moving easily in tight spots or down narrow aisles with big loads, American Cranes were designed for *all* the tough jobs. Combined with any front, crane or excavator, they give you top performance on every move.

American DiesELectric* Locomotive Cranes, with capacities to 130 tons, that swing, travel, hoist, and raise or lower its boom (all at the same time, if necessary) will give you the ultimate in fast, efficient pin-point spotting. Detailed operating records show that American DiesELectric* Cranes can write off . . . work off . . . their initial cost in a few years. American Cranes are outstanding . . . just ask any owner. Or write us for detailed and illustrated information on American equipment that has served industry for more than three-quarters of a century.

*Trademark

DERRICKS-HOISTS to 800 tons
REVOLVER CRANES to 400 tons

EXCAVATORS-CRANES to 2 yds.-60 tons
LOCOMOTIVE CRANES to 130 tons

AMERICAN HOIST
and Derrick Company
St. Paul 7, Minnesota

AMERICAN HOIST PACIFIC COMPANY
Special materials handling equipment

CROSBY-LAUGHLIN DIVISION
Drop forged fittings for wire rope-chain

For more facts circle 613 on Reply Card

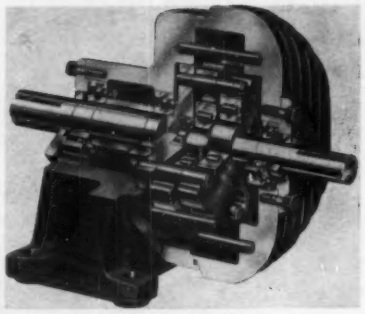
NEW PRODUCTS

(Begins on page 156)

series wound electric drive motor, forming a synchronized power package which supplies instant power. Fast acceleration and travel speed, up to 9 mph, company says, are desirable for pneumatic-tired applications. Other features are controlled inching, 360-deg circle visibility, accessibility of driver's seat from either side of truck. Automatic Transportation Co.

69—REDUCTION DRIVE, compact cycloid type

As a result of their cycloid design, Hi-Range Drives are 40 to 60 per cent smaller than other types of reducers with comparable ratings, manufacturer states; they provide a wider range of torque, and, pound for pound, a higher torque—from about 30 in.-lb per pound of reducer weight to over 80 in.-lb torque per pound. They provide a wide selection of ratios, and are said to run virtually without noise in an oil-sealed cast



iron housing, with a number of teeth carrying the load at all times. The units are suggested for applications where weight or space—or both—are important and where, in addition, high torque is required. Sizes vary from small units to those for large machine tools. Black Tool, Inc.

70—TRUNCHEON can broadcast burglar alarm, too

The Electronic Truncheon is of the regular wooden variety, about 14 in. long, but has a built-in transmitter capable of sending out a signal when a button is pressed. The signal can be used to operate a burglar alarm. It allows a watchman to sound an alarm instantly anywhere in the building or area. The electronic signal is picked up by an induction loop and is transmitted to a receiver located at any convenient point. When the signal is picked up by the receiver, it closes a relay which activates the alarm system—bells, floodlights automatic telephone calls to police. Multitone of Canada Ltd.

71—CIRCUIT BREAKERS use stored energy principle

All frame sizes of this company's low voltage power circuit breakers can now be operated manually or electrically utilizing the stored energy principle. Stored-energy spring-close mechanisms are designed to provide positive constant, highspeed closing of contacts resulting in greater safety and prolonged contact life. Frame sizes, designated AK-2-50, 75 and 100, are rated 1600, 3000 and 4000 amp respectively, up to 600 v. Principal advantage noted is that the low-cost manual breakers may be used in many applications formerly requiring elec-

"A Few Hours Ago That Partitioning Wasn't There!"

Talk about *versatility!* You can use Phoenix Wire Mesh Partitions most anywhere . . . around general stores, stock rooms and tool rooms, or for departmental divisions, corridors and restricted areas. What's more, you can relocate Phoenix partitions as often as required by changes in plant layout. For they can quickly, easily be disassembled and reinstalled . . . oftentimes in a matter of hours . . . by a small crew of your own men.

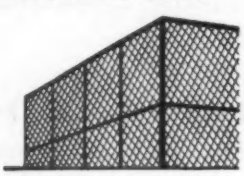
Wire mesh partitioning offers other important advantages, too. It's ideal where lighting conditions and the free flow of air must be considered . . . perfect where unit air conditioners or heaters are in use. They don't interfere with vision or sound . . . they don't obstruct fire extinguishing systems, either. It's the right answer in fact, to all partitioning problems . . . so write today for Bulletin #58.

SINCE 1885 ONE OF THE NATION'S LEADING MANUFACTURERS OF WOVEN WIRE PRODUCTS

PHOENIX WIRE WORKS, INC.

1958 E. KIRBY • DETROIT 11, MICHIGAN

Telephone: WAlnut 2-4520

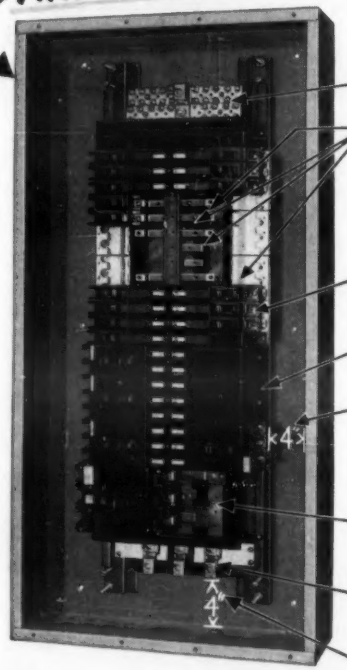


For more facts circle 614 on Reply Card

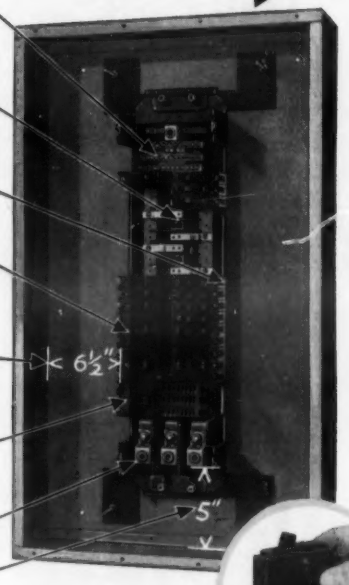
YOU ARE LOOKING AT THE GREATEST IMPROVEMENT IN PANELBOARDS IN MORE THAN 20 YEARS!

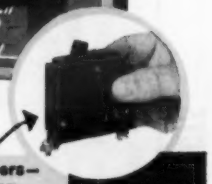
This is what you've been using

This is what Square D's New NQOB Gives You*



Binder-head Screw Neutral Taps	Box-type Neutral Lugs
Large Number of Parts Required for Additions and Replacements	Simplified Breaker Connection— One Screw All Joints Plated Bussing Like Wiring Diagram You Can See What Phase You're Connected To
Screw Terminals on Branch Circuit Breakers	Box Lugs on All Circuit Breakers
Unable to Mount One and Two Pole Breakers Opposite Three Poles	One and Two Pole Breaker May Mount Opposite Three Poles
Cramped Side Gutters	20"-wide Box Provides Roomy Side Gutters and Plenty of Room for Conduit in End Wall
Special Installation Required for 100 Amp Frame Breakers	100 Amp Frame Breaker May Replace Two 50 Amp Frame Breakers
Lugs for Copper Conductors Only	Lugs for Either Copper or Aluminum UL Approved
Minimum End Gutters	Full 5" End Gutters





Write for the complete story Square D Company, 6060 Rivard Street, Detroit 11, Michigan

SQUARE D COMPANY

* The QO in NQOB means QWIK-OPEN breakers—they trip instantly at 10 times full load rating. The B in NQOB means BOLTED CONNECTIONS. If you prefer plug-in construction, specify NQO

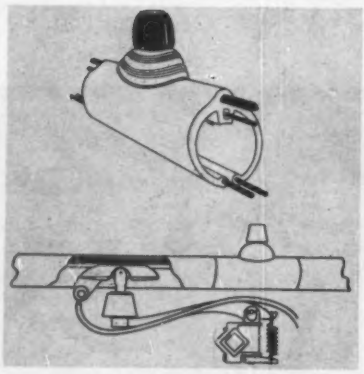
NEW PRODUCTS

(Begins on page 156)

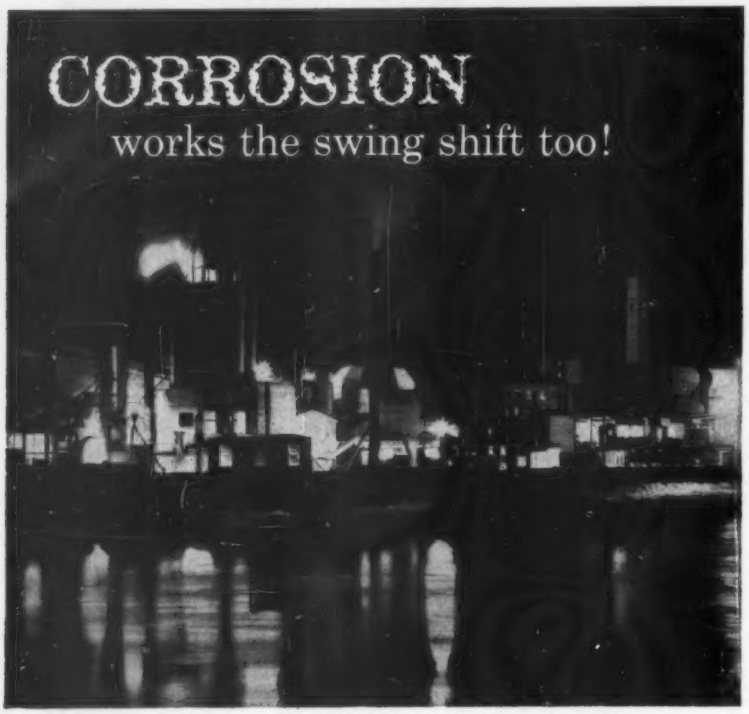
trical breakers, as in selective tripping systems. They are also suggested for intermittent motor starting. General Electric Co.

72—TROLLEY SYSTEM has its live parts covered

All live parts are covered in the Penrose Trolley System, announced as adaptable to new or existing installations—without plant shutdown. Installation is by clipping the Neoprene duct to the wire. The entire trolley wire is covered by this flexible duct which has a self-closing slot through which the trolley shoe passes. Current is carried by insulated jumpers. The contact shoe is supported on an insulator on the end of the arms.



Use of the Neoprene ducts enables use of straight or curved runs without risk of cracking, expansion, contraction or combustion, it is pointed out; and the system may be used outside as well as inside. Shoe action keeps ice from forming on conductor and serves to automatically de-ice the safety duct. Northbrook Products, Inc.



Thousands of miles of underground pipe feed natural gas to factories . . . other pipelines distribute oil and other petroleum products. And every foot . . . every inch . . . could corrode and leak anytime, day or night.

Electro Rust-Proofing can assist in the big job of corrosion control. Assist with surveys, design recommendations and actual installation of corrosion control systems.

Even if you have your own corrosion engineering group, ERP can swing extra manpower and engineering experience onto rush jobs—supplement your own team on the special problems.

For full information on ERP Pipeline Corrosion Control, Write Dept. E-52.72.

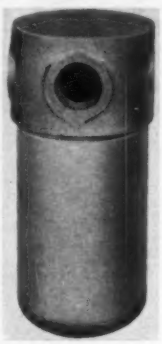
ERP CATHODIC PROTECTION SINCE 1935

ELECTRO RUST-PROOFING CORP.
A SUBSIDIARY OF WALLACE & TIERNAN INC.
30 MAIN STREET, BELLEVILLE 9, NEW JERSEY
CABLE: ELECTRO, NEWARK, N. J.

For more facts circle 616 on Reply Card

73—IN-LINE FILTER works either side of pump

The Hydraulic In-Line Filter, applicable for either pressure or suction side of pump, is designed for protection of hydraulic machinery and oil recirculating equipment. According to the manufacturer, advantage of assembly on either side of pump is twofold. First, filter element is readily accessible for cleaning or replacement, eliminating necessity for disassembly or draining sump tank. Second, the piping and maintenance of hydraulic system is simplified. Filter has three parts, two "in" and one "out," for convenince and flexibility. Maximum operating pressure is 150 psig. Filter is designed to prevent scored cylinders, valve leaks and pump failures. Arrow Tools, Inc.



74—ALARM BELL rings when trucks back up

Warn-A-Larm, a gravity-actuated mechanical back-up alarm which rings in reverse only, it introduced for lift-trucks as well as roadtrucks. Designed for easy installation on the hub of a rear wheel, the Warn-A-Larm sounds a loud warning four times with every revolution of the wheels in reverse. When the wheel moves forward, striker devices rest almost motionless in V-nests; in reverse, they slip out of the sockets as each reaches the apex of the revolution and drop through a channel to strike the rim of the bell. The alarm iteslf is a 6-in. diam bell of chrome plated steel. The unit is furnished with mounting brackets and fasteners. Three sizes of brackets fit most truck hubs. Warn Sales Co.

STOP TEARING YOUR HAIR

because Motor Burnouts are slowing production

SP9-67

...3-Phase Motors with built-in KLIXON PROTECTORS

- ***Permit Maximum Motor Output***
- ***Reduce Costly Down Time***
- ***Eliminate Motor Burnouts***

Will the life of your 3-phase motors equal that of the equipment in which they are installed . . . or will they burn out causing unnecessary down time and costly production delays?

You can be sure of full motor life by specifying on your equipment and replacement motor purchase order, "these motors to include KLIXON Protectors."

The advantages to you are . . . safe maximum motor output under all operating conditions . . . simplified motor controls . . . reduced motor repairs and replacements . . . reduced costly production down time due to motor burnouts.

Built in by the motor manufacturer, they safeguard your motors and prevent overheating and burnouts caused by the following conditions —

Prolonged overloads, unbalanced voltage, stalling, failure to start, increased ambient temperatures, lack of ventilation, plugging or reversing duty, and single phasing.

KLIXON-Protected Motors are now available from your motor supplier. Specify and use motors with KLIXON Inherent Overheat Protectors. The savings obtained more than offset the slight additional cost.

Bulletin PR-1243 gives the complete story. Write for your copy, today.

METALS & CONTROLS

4512 FOREST STREET, ATTLEBORO, MASS., U.S.A.

A DIVISION OF TEXAS INSTRUMENTS INCORPORATED

SPENCER PRODUCTS: Klixon® Inherent Overheat Motor Protectors • Motor Starting Relays • Thermostats • Precision Switches • Circuit Breakers

For more facts circle 617 on Reply Card

New Way to Stop Faucet Leaks!

★ 9-in-10 washers are fastened with TOO LONG or SHORT SCREWS thus loosen and destroy themselves. Leaks quickly follow!

34 YEARS OF RESEARCH REVEALS NEW SOLUTION

★ New, patented 'Sexauer' SELF-LOCK screws have imbedded expanding NYLON PLUG. They lock at required depth AUTOMATICALLY, hold washers firmly! Made of MONEL, they are rustproof, non-corroding. Heads can't twist off. Screw slots can't distort.

★ NEW, improved 'Sexauer' EASY-TITE faucet washers are made of super-tough, pliable du Pont compound (not rubber or fibre). Reinforced, like a tire, with a vulcanized layer of Fiberglas, they resist distortion and splitting from shut-off grind and squeeze.

★ Faucet leaks repaired with 'Sexauer' EASY-TITE washers and SELF-LOCK screws outlast ordinary repairs "6-to-1"!

HIDDEN COSTS OF FAUCET LEAKS!

Hackensack, N.J. Water Co. and American Gas Association figures prove stopping just ONE PIN-HOLE SIZE (1/32") LEAK saves you 8,000 gal. water quarterly. A HOT WATER FAUCET LEAK repair saves you over $7.58 QUARTERLY in fuel and water bills. Fewer leaks also produce important savings on MATERIALS, LABOR and COSTLY FIXTURE REPLACEMENTS!

A 'Sexauer' Technician will make available our NEW Catalog, Edition "J", listing our entire line of over 3,000 TRIPLE-WEAR plumbing repair parts and tools. He will survey your fixtures, determine the repair parts needed and establish an efficient stock arrangement and control to prevent costly overstocking or shortages. You get this service without obligation. *Act now!*

J. A. Sexauer Mfg. Co., Inc., Dept. S-129
2503-05 Third Ave., New York 51, N.Y.

Please send me a copy of your Catalog "J"

Name _____ Title _____

Organization _____

Bus. Address _____

City _____ Zone _____ State _____

SEXAUER

For more facts circle 618 on Reply Card

New Plant Construction

(Continued from page 144)

films, adhesives and wire insulation. Expansion will be a multi-million dollar project and work, to begin at once, is scheduled for completion by the fall of 1960.

De Witt, N. Y.—Chrysler Corp., 344 Massachusetts St., Detroit, Mich., plans to construct a multi-million dollar facility in this town, just east of Syracuse, N. Y. New plant will be constructed on a 125-acre site adjacent to the New York Thruway and will produce manual transmissions and rear axle assemblies for the corporation's new Valiant car and manual transmissions used in the company's other cars and trucks.

Winston-Salem, N. C.—Hanes Hosiery Mills Co., 1325 Ivy Ave., N. E., this city, has awarded a contract to the Fowler-Jones Construction Co., 10 32nd St., this city for the construction of a 635,000-sq ft brick, concrete block and steel hosiery mill. It will be completely air-conditioned. Plant will represent an investment of $12 million. Work will get under way at once for completion by the spring of 1961.

Middletown, O.—Armco Steel Corp., 1939 Armco Ave., plans major addition to company's research center. Company plans to double existing facilities here at a cost of $3.5 million. Construction will get under way at once and will be completed some time in the spring of 1961.

Bartlesville, Okla.—Phillips Petroleum Company has announced that Phillips Chemical Co., a wholly owned subsidiary, will further expand ethylene capacity at company's Sweeny, Texas, facility by about 35 million lb a year to meet increased sales requirements. Expansion now under way will raise plant's capacity to 290 million lb when completed in the second quarter of 1960.

Beaumont, Texas—Magnolia Petroleum Company, subsidiary of Socony Mobil Oil Co., 26 Broadway, New York, N. Y., plans to construct second phase of company's ethylene unit at local refinery here. Construction will get under way early in 1960 for completion some time in 1962 at a cost in excess of $22.5 million. Construction of the third stage is scheduled for late 1960 or early 1961 at a cost of about $18 million. Plant will be in full production by late 1963.

Gladewater, Texas—Tidewater Oil Co., M. Esperson Building, Houston, Texas, plans to construct a raw gas plant to produce sulfur and recover liquid products. Work will include construction of the plant, earthwork to provide storage for residue gas to maintain reservoir pressure, a repair shop, equipment storage and plant area lighting. Work is already under way and is scheduled for completion by the spring of 1961. Plant will cost $6 million.

Norfolk, Va.—Lone Star Cement Corp., 342 Madison Ave., New York, N. Y., plans expansion of company's cement plant located here. Expansion will include a new kiln that will increase annual capacity to 2,300,000 bbl a year from about 1,300,000 now. Work will begin soon and plant will go into full production by the spring of 1961.

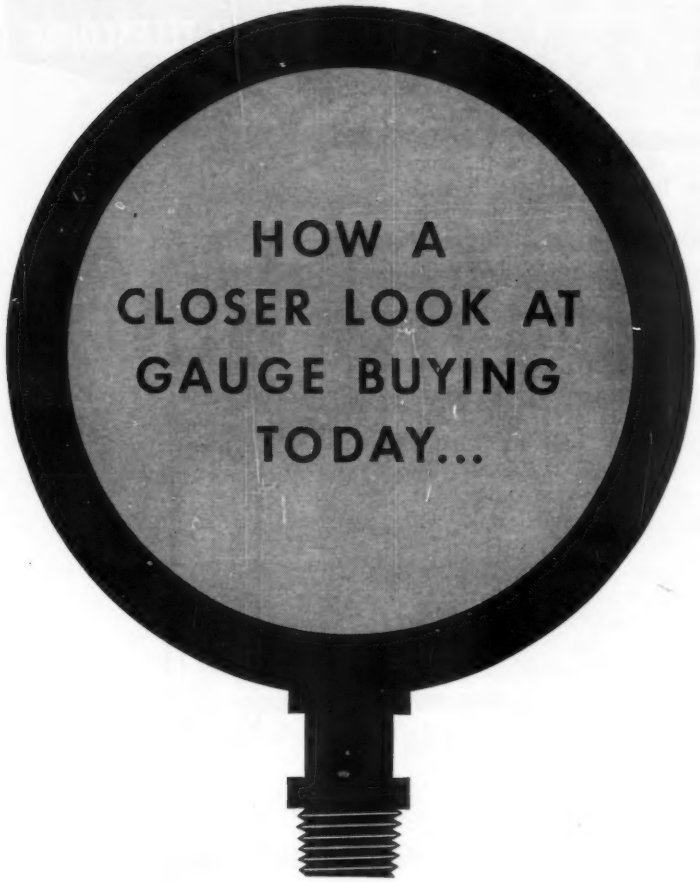
Richmond, Va.—Reynolds Metals Company, Reynolds Building, plans to construct three new facilities at company headquarters, located here. Included in the program will be a research center, a products display building and another administration building. Marcellus Wright & Son and Baskervil & Son, both Richmond firms will design the buildings.

Tumwater, Wash.—Olympia Brewing Co., Olympia, Wash., plans major addition to company's brewery located here. Company plans a three-story addition, 60 by 80 ft of steel frame and reinforced concrete, including a warehouse addition of some 25,000 sq ft. Contract on the construction work has been let to the A. G. Homann Co., Lacey, Wash., for $1.9 million.

Fairmont, W. Va.—Fairmont Aluminum Company, subsidiary of Cerro de Pasco Corp., 300 Park Ave., New York, N. Y., plans major expansion at local plant. Company plans to add a new aluminum rolling mill and auxiliary equipment at a cost of about $10 million. Work on the new facility will begin at once for completion by the fall of 1962. A. J. Boynton & Co., 111 N. Wabash St., Chicago, Ill., is the consulting engineer of the project.

Glendale, Wis.—Red Star Yeast & Products Co., subsidiary of Milwaukee Vinegar Co., 221 E. Buffalo St., Milwaukee, Wis., will start construction soon on a $1-million office and laboratory center in this suburb of Milwaukee. New installation will have a floor area of approximately 40,000 sq ft.

"There's been an explosion in the basement? . . . You're kidding . . ."

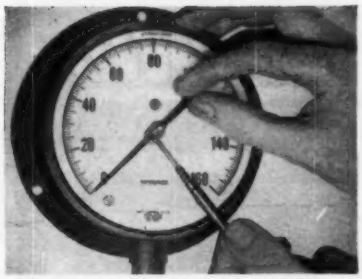


can help cut your gauge maintenance costs

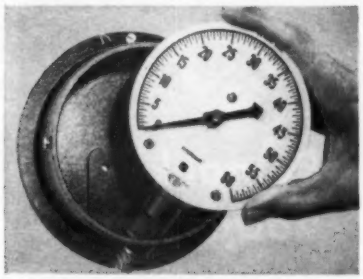
Been taking gauges pretty much for granted? As to the price you pay, accuracy you buy, performance you get . . . gauges you use and their maintenance costs? Maybe it's time for a closer look at the United States Gauge line and how it can streamline buying. USG features the most comprehensive line of indicating dial pressure gauges you can draw on . . . in range of case styles, materials and sizes, in pressure ranges and in price . . . up to the finest gauges money can buy. The *completeness* of the USG line can help you avoid over-buying, under-buying, help you get exactly the gauge performance you pay for . . . from one source! As shown at right, exclusive USG design features even help cut maintenance costs. Check your USG distributor for your next gauge requirement. See the Yellow Pages, or write for catalogs and name of your nearest USG distributor, today.

UNITED STATES GAUGE
Division of American Machine and Metals, Inc., Sellersville, Pa.

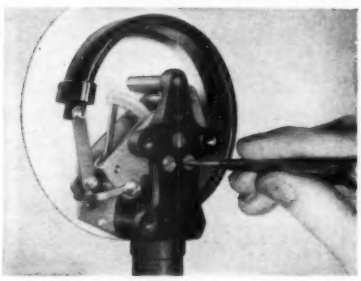
Find Your Nearest Distributor in The "Yellow Pages"



NOTE that with a USG Supergauge®, complete recalibrations can be made faster than with any other process gauge. For example: "zero shift" adjustments are made from the front with gauge in operating position, and without removing pointer from the shaft.



NOTE that with USG Mono-Unit design, internals are in one assembly which lifts out intact. Legend on dial gives full information for instant identification of model number and materials in components. More maintenance minutes saved!



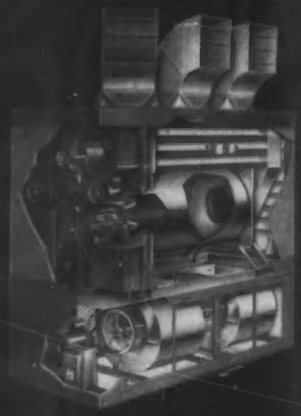
NOTE that with USG Arc-Loc® movement, corrections for "scale shape" (linearity) errors and "range" adjustments are both made from the rear; no need to remove pointer and dial. USG's unique locking method eliminates creep during locking, saves more time! USG Supergauges meet A.S.A. standards for Grade AA Test Gauges, including accuracy to ½ of 1%. *Write for Catalog 1819.*

SAVINGS IN USG A-LINE, TOO!
Premium gauge construction at savings up to 40% of premium prices! Major economies in pressure measurement where you may now be buying more gauge than you need! Meets A.S.A. Grade A standards, including accuracy of 1%. Wide choice of options. Has Supergauge Mono-Unit design — cuts recalibration time. *Write for Catalog 305.*

For more facts circle 619 on Reply Card

LENNOX

"OG" SERIES
INDUSTRIAL HEATER



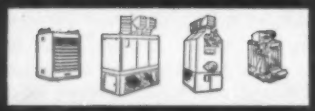
Remarkable Adaptability

Efficient heat transfer design results in reduced physical size of this heater . . . allowing it to take up a minimum of space. If floor space is at a premium, the "OG" can be suspended horizontally or inverted. Removable nozzles permit free standing or ducted installations.

DUAL FUEL
Power Burners

Burner operates equally well with either gas or oil. Changeover is instant and automatic.

LENNOX "Task-Matched" Equipment to control and condition air for industry



64,000 to 2,000,000 Btuh

CLIP AND MAIL FOR FREE SPEC SHEETS

LENNOX Industries Inc.
INDUSTRIAL DIVISION
P.O. Box 1294, Dept. PE12
Des Moines 5, Ia.

Please send me—without obligation—complete specifications and engineering data on Lennox "OG" Series Industrial Heaters

Name.....
Company.....
Address.....City.....
Title.....

For more facts circle 620 on Reply Card

Air Compressor

(Continued from page 106)

on the north side of the building if possible.

For every 10 F cooler air coming into the compressor, an actual increase of 2 per cent in delivery is obtained. However, at the same time the intake line should be kept to a minimum; it should be the full diameter of the intake on the compressor. If more than 15 ft long, use the next size larger pipe. The aftercoolers can be stacked one on top of the other with a bypass between them. The placing of pipe in trenches is recommended. This will make a neater layout and save space.

It is very important that the main air line be sized to take the entire load plus future expansion. Tables showing pressure drop are found in the Compressed Air Handbook. The loop system is always recommended. This allows use of smaller pipe and assures a more equal distribution of air throughout the plant. It is recommended that this loop be tied together somewhere in the middle of the plant and that the entire loop be equipped with valves so various sections can be shut off while new connections are made.

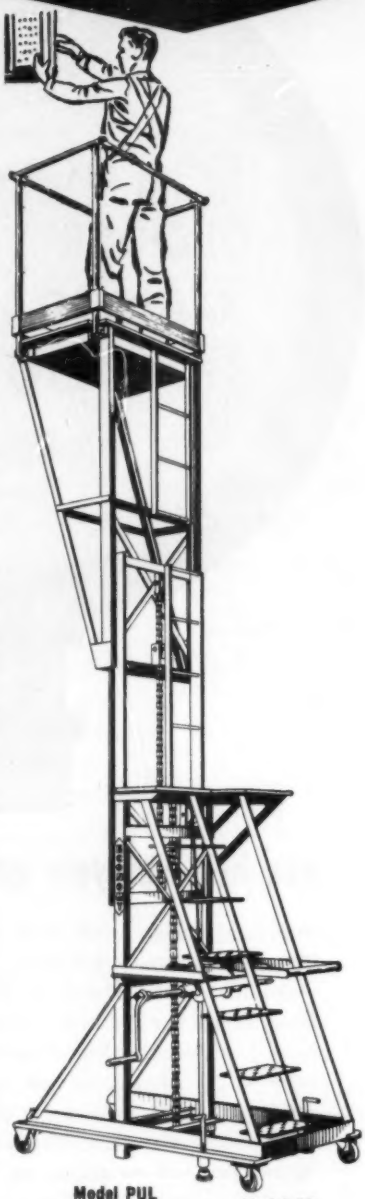
Moisture and oil moves along the pipe at a speed depending upon the velocity of air. If this velocity is kept low enough, most of the liquid will flow along the bottom of the pipe. Outlets should always come off the top to prevent carryover. Drain legs should be installed several places in the loop. Effective drains can be made by simply dropping a piece of pipe, the same size as the main line, down close to the floor. This can then be tapped and a small ¾-in. pipe with valve put in it. **End**

Ultrasonic Cleaning

(Continued from page 115)

must meet certain conditions. Generally their density must be about that of water or a little higher. They must have a relatively low vapor pressure at the working temperature of the bath (90 to 100 F). They must remain thin-bodies and nonviscous at that temperature. These three characteristics—density, volatility, viscosity—are the important

Speed overhead servicing—
Stop accidents with a
HI-REACH TELESCOPER



Model PUL (illustrated)
Lift 10'9"—$370.00
Lift 15'0"—$400.00

Model LB
Lifts 20' to 40'
$1510.00 up

Custom built Hi-Reach Telescopers up to 100 ft.
Write for complete catalogue

Headquarters for standard and special built overhead servicing lifters and material handling equipment since 1901.

ECONOMY ENGINEERING
4514 West Lake Street, Chicago 24, Illinois

For more facts circle 621 on Reply Card

POINT BY POINT

FOAMGLAS®

INSULATION

PROVED BEST

FOR THIS HIGH VOLTAGE ENGINEERING CORP. ROOF

Cut heating costs by $8,500 a year. Eliminate roof deck punctures. Stiffen the roof deck, and cut roofing installation costs. That is why High Voltage Engineering Corporation picked FOAMGLAS roof insulation for their new $1½ million plant at Burlington, Mass. A comparison of competitive roof insulations showed that FOAMGLAS alone would serve so well. Why? Consider these major comparison points:

MOISTURE RESISTANCE—FOAMGLAS had the only completely moisture-proof structure and composition . . . to insure never-changing insulating protection . . . without a separately applied vapor barrier. And since a ponded roof is used on the High Voltage plant, FOAMGLAS proves doubly valuable. Even with a puncture in the built up roofing water can't penetrate the sealed glass cells of FOAMGLAS: invaluable protection for the manufacturing of costly radiation equipment below.

COMPRESSIVE STRENGTH AND RIGIDITY—No real comparison! In fact, FOAMGLAS adds substantial stiffening to the steel roof deck. It's strong enough to withstand over seven tons per square foot . . . even helps prevent punctures of the roofing membranes.

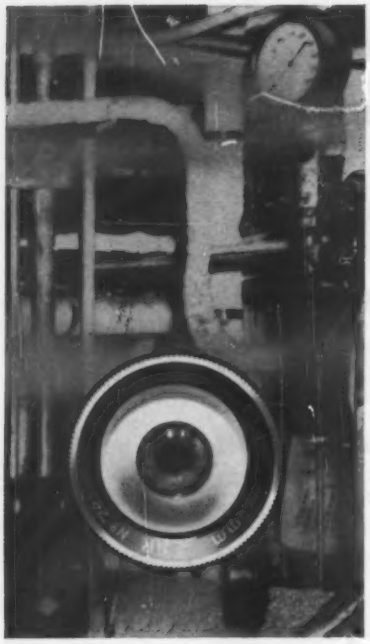
LIGHT WEIGHT, EASE OF CUTTING—FOAMGLAS proved far superior in this combination of characteristics. Light in weight, it made it practical to design cantilevered roof deck sections. And since FOAMGLAS is easy to cut quickly and accurately with ordinary tools, it saves installation time and money.

Next time *you* face a roof insulation problem, remember these comparisons. Pick FOAMGLAS . . . now available in a *new* 1¾" *thickness*, as well as thicknesses of 2", 3" and 4". Send for our new Building Insulation Catalog. Pittsburgh Corning Corporation, Dept. PE-12⁹ One Gateway Center, Pittsburgh 22, Pa. In Canada: 3333 Cavendish Blvd., Montreal, Quebec.

High Voltage Engineering Corp. Plant, Burlington, Mass.
Architect: Carleton R. Richmond, Jr., A.I.A., Cambridge, Mass.
General Contractor: Aberthane Construction Co., Boston, Mass.
Roofing Contractor: A. Belanger & Sons, Inc., Cambridge, Mass.

PITTSBURGH PC CORNING

For more facts circle 622 on Reply Card



keeping an unblinking eye

on hazardous atmospheres is a continuous job for GPL closed-circuit TV in the propane deasphalting pilot unit at Esso Research and Engineering.

How many jobs could GPL Industrial TV help you do better?

You'll never know until you investigate! You'll be amazed at the versatility, simple operation, and low cost of Industrial TV systems by GPL, one of the world's leading manufacturers of industrial, military and broadcast TV.

Write us today for free, illustrated brochure on GPL—the most complete line in the industry.

GPL | A GENERAL PRECISION COMPANY

GENERAL PRECISION LABORATORY INC.
PLEASANTVILLE, NEW YORK

For more facts circle 623 on Reply Card

Ultrasonic Cleaning

(Continued from page 208)

ones from the standpoint of cavitation (ultrasonic cleaning action).

Other points to be considered in plant use are flammability, toxicity of vapors from open tanks, and residue left after evaporation.

Carbon tetrachloride would be ruled out because of toxicity (M.A.C. 25) and two others by reason of their high vapor pressures (chloroform and methylene chloride).

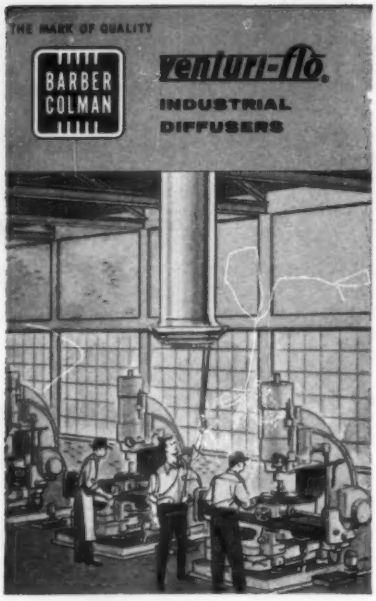
Trichlorethane is recommended for open-tank cleaning, where the solvent is not continually being redistilled as in a vapor degreaser.

Stabilized trichlorethylene is the commonly used vapor degreaser solvent because of its lower boiling point (189 as against 250 F for perchlorethylene) and because of its low heat of vaporization (about one tenth that of water).

Perchlorethylene degreasers are used for light-gage metal articles and some white metal parts. The high boiling point is advantageous in driving out moisture entrapped in recesses or blind holes, as well as in softening high melting point waxes in buffing compounds.

Trichlorethane answers most of the requirements for a high-quality ultrasonic solvent—lowest toxicity, zero residue, nonflammable, low cost—and it cavitates exceptionally well. Trichlorethane is ideally suited for cleaning assembled printed circuit boards, precision electro-mechanical devices, electronic components such as switches, relays, etc.; motors, armatures, gears, die-castings and most metal or ceramic products, where no trace of hydrocarbons is permissible on the cleaned part, a special requirement for cryogenic systems.

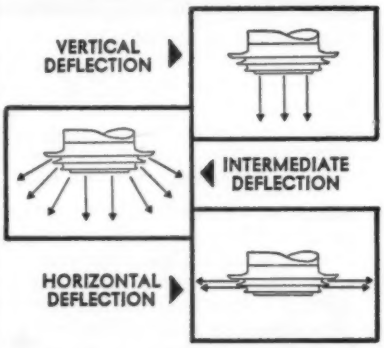
Volatile chemicals such as concentrated ammonia, benzol, carbon tetrachloride, naphthas and trichlorethylene vaporize more rapidly under cavitation than when they are used in mechanical cleaning machines. Continued exposure to these fumes is to be strictly avoided. In industrial plants, where ultrasonics require the use of these chemicals, adequate ventilation is provided of necessity. Covering the tank during operation will eliminate fumes, although it is still a good idea to avoid continued exposure. **End**



Fresh air at working level improves employee efficiency

Barber-Colman Model BP Venturi-Flo industrial diffusers permit air to be piped down to working level. This prevents stagnant, smoky air which has collected near the roof, from being mixed with the incoming fresh air. The contaminated air is readily expelled by roof exhaust fans. Employee comfort and efficiency are measurably improved.

The Venturi-Flo industrial diffuser can be adjusted easily from the floor to deliver any air pattern. In warm weather, the air should be delivered close to, or even directly at, the worker; while



during cool evenings, or in cold weather, the air should be diffused above the head of the worker, providing adequate ventilation, but eliminating cold drafts.

A complete range of sizes is available to meet any industrial requirement. Get complete information in Bulletin F7722-1 — performance data, installation diagrams, and dimensions. Call your Barber-Colman field office or write:

BARBER-COLMAN COMPANY
Dept X, 1139 Rock Street, Rockford, Illinois

For more facts circle 624 on Reply Card

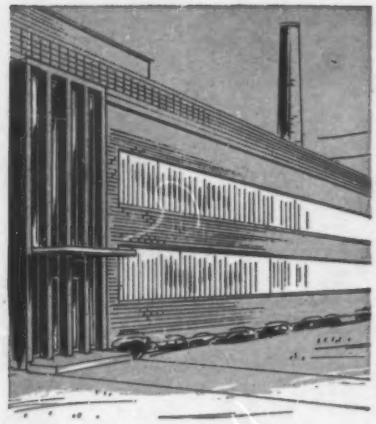
Lightweight!
Corrosion-resistant!
Competitive in cost!

Reynolds Aluminum Electrical Rigid Conduit cuts both installation and maintenance costs. It's light in weight, thus easier to handle, faster to install. It's easy to work with—bends and forms quickly and accurately. It won't rust—ever. It's non-magnetic. It will not spark from accidental contact with hard objects.

For more information and names of Reynolds Aluminum Conduit outlets, call your nearby Reynolds Sales Office or write *Reynolds Metals Company, Box 2346-EQ, Richmond 18, Virginia.* Also write for descriptive brochure.

Watch Reynolds TV shows—**"ALL STAR GOLF", "BOURBON STREET BEAT"** and **"ADVENTURES IN PARADISE"—ABC-TV**

For more facts circle 625 on Reply Card



For unbreakable windows and skylights

NEW

Stylux ™ BY BUTLER

LONGER-LASTING SHATTERPROOF PLASTIC PANEL

End window breakage and glare, cut glazing expense with new weatherproof Stylux, the longer-lasting panel. New, improved resins and fiberglass mat plus superior bonding process create a premium-quality panel with up to 90% light transmission. Costs less to install, too, with new 4-ft. coverage widths. Also all standard sizes. Get literature, specs, from your Building Supply Dealer, Glazing Contractor or write direct.

Stylux BY BUTLER

Plastics Department,
Buildings Division
BUTLER
MANUFACTURING
COMPANY
Dept. 113, 7400 East 13th Street
Kansas City 26, Missouri

For more facts circle 626 on Reply Card

NEW BOOKS

for the plant engineer

Corrosion

CORROSION OF CHEMICAL APPARATUS. Size 9¼ by 6⅛ in.; 250 pp; illustrated; cloth bound. Published by the Consultants Bureau, 227 West 17th St., New York 11, N.Y. Price $7.50.

INTERCRYSTALLINE corrosion and stress corrosion are discussed in this publication which contains a translation of material originally presented in Russian by G. L. Shvartz and M. M. Kristal. Information in the book is based on their investigations.

In the treatment of the causes the authors have delved into such factors as the effect of welding, plastic deformations and aggressive medium. There are separate chapters on the corrosion cracking of carbon and alloyed steels, stainless steels, and nonferrous metals. These are followed by material on methods of protection against this type of cracking and testing methods.

At the end of the book a bibliography of 219 references appears. All the Russian literature that is listed has been translated into English.

Building Details

INDUSTRIAL BUILDING DETAILS by D. F. Roycraft. Size 11⅞ by 9 in.; 352 pp including index; illustrated; cloth bound. Published by F. W. Dodge Corporation, 119 West 40th Street, New York 18, N.Y. Price $12.75.

OUTGROWTH of a collection of handy information that the author had collected for his work, this book contains over 1500 building details.

Drawings in the book are sharp and clear. Among the details that are covered are those pertaining to the following: walls and windows, roof and parapets, ventilators and stack curbs, flashing, doors and door frames, ladders and platforms, catch basins, manholes, expansion joints.

In the back of the book there is listing of detail abbreviations and their meanings and a key to drawing symbols used for different materials.

Hot Coatings

HOT ORGANIC COATINGS by Raymond B. Seymour. Size about 9¼ by 6¼ in.; illustrated; 233 pp including index; cloth bound. Published by Reinhold Publishing Corporation, 430 Park Ave., New York 22, N.Y. Price $7.50.

HELPFUL information on a variety of coatings is presented in this BOOK. The material discusses composition, sources, and applications. The book includes in its coverage hot spray techniques and the advantages of this method of application and briefly outlines numerous tests for various coatings which have been applied hot.

Among the other principal topics of discussion are the following: asphalt and related minerals; petroleum waxes; animal, vegetable, and insect waxes; and hot-applied coal tar pitch-base coatings.

There are numerous tables in the book dealing with such items as specifications of materials, chemical resistance, and properties of hot organic coatings.

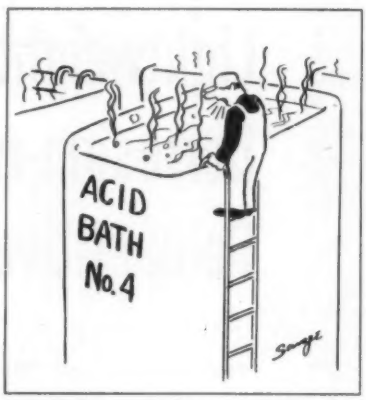
Electrical Code

NATIONAL ELECTRICAL CODE —1959. Size 7¼ by 4¾ in.; 528 pp including index; paper bound. Published by National Fire Protection Association. Copies available from the American Standards Association, Inc., 70 East 45th St., New York 17, N. Y. Price $1.00.

MORE THAN sixty changes are incorporated in the latest edition of the current code as compared to the 1956 edition. This edition has a cross index matching the numerical identifications of information in the 1959 code with those of the 1956 code. Changes in code material are indicated by bold type and the section numbers are also underlined.

Some of the tables have been moved into code sections to which they relate. This idea should facilitate reference work. Exceptions to general code rules are printed in italics.

Areas covered by this code are as follows: wiring design and protection; wiring methods and materials; equipment for general use; special occupancies; special equipment; special conditions; communications systems.



"Joe, I was only kidding—there ain't no plug. Hey, Joe!"

a modern installation starts with proper systems

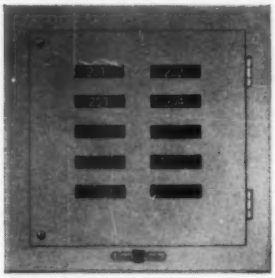
FOR PLANT CONTROL · COMMUNICATION · PROTECTION

When you modernize or expand your plant's facilities, remember that modern signaling systems can benefit plant operation in 2 important areas: greater safety to life and property, and increased efficiency and productivity. Industrial systems, designed and manufactured by Edwards, include automatic and manual fire alarm systems—coded personnel paging—synchronous clock systems—program scheduling—alarm and process control annunciators—and a full range of audible signals and communications equipment. The Edwards Technical Representative and your local Edwards Distributor salesman will be glad to survey your particular plant signaling needs. There is no obligation for this service.

HERE'S A CASE HISTORY EXAMPLE OF HOW THIS TEAM WORKING WITH THE ARCHITECTS SOLVED AN UNUSUAL SIGNALING PROBLEM.

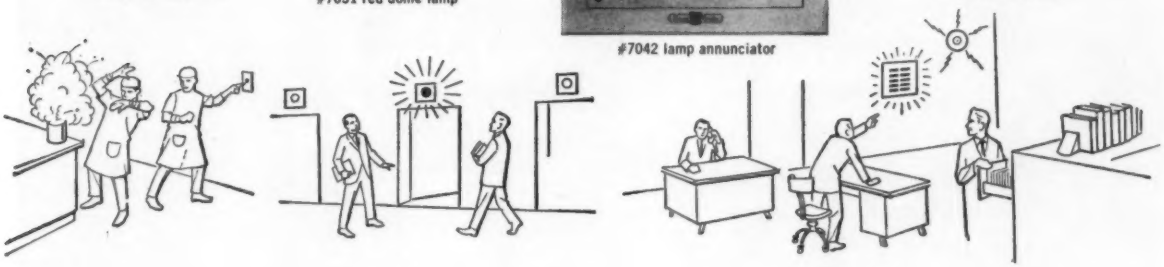
#7603 alarm button

#7031 red dome lamp



#7042 lamp annunciator

#340 warning bell



THE PROBLEM: to design an easily activated employee alarm system to protect laboratory technicians at National Dairy Products Corporation's new research and development center in Glenview, Illinois, designed by Childs & Smith of Chicago, Ill. THE SOLUTION FROM EDWARDS: (1)—a lamp annunciator installed at a central location, showing alarm zones by floors. (2)—red dome lamps mounted over each of 152 workroom entrances. (3)—over 300 alarm buttons, two installed in each room.

OPERATION: should an accident occur, the employee has two choices. (1)—enter his individual shower, turn the shower handle, thereby lighting the red dome lamp over his doorway, and flashing a zone indication on the central annunciator while an adjacent alarm bell rings; (2)—push either wall-mounted alarm button, thereby setting off the same system.

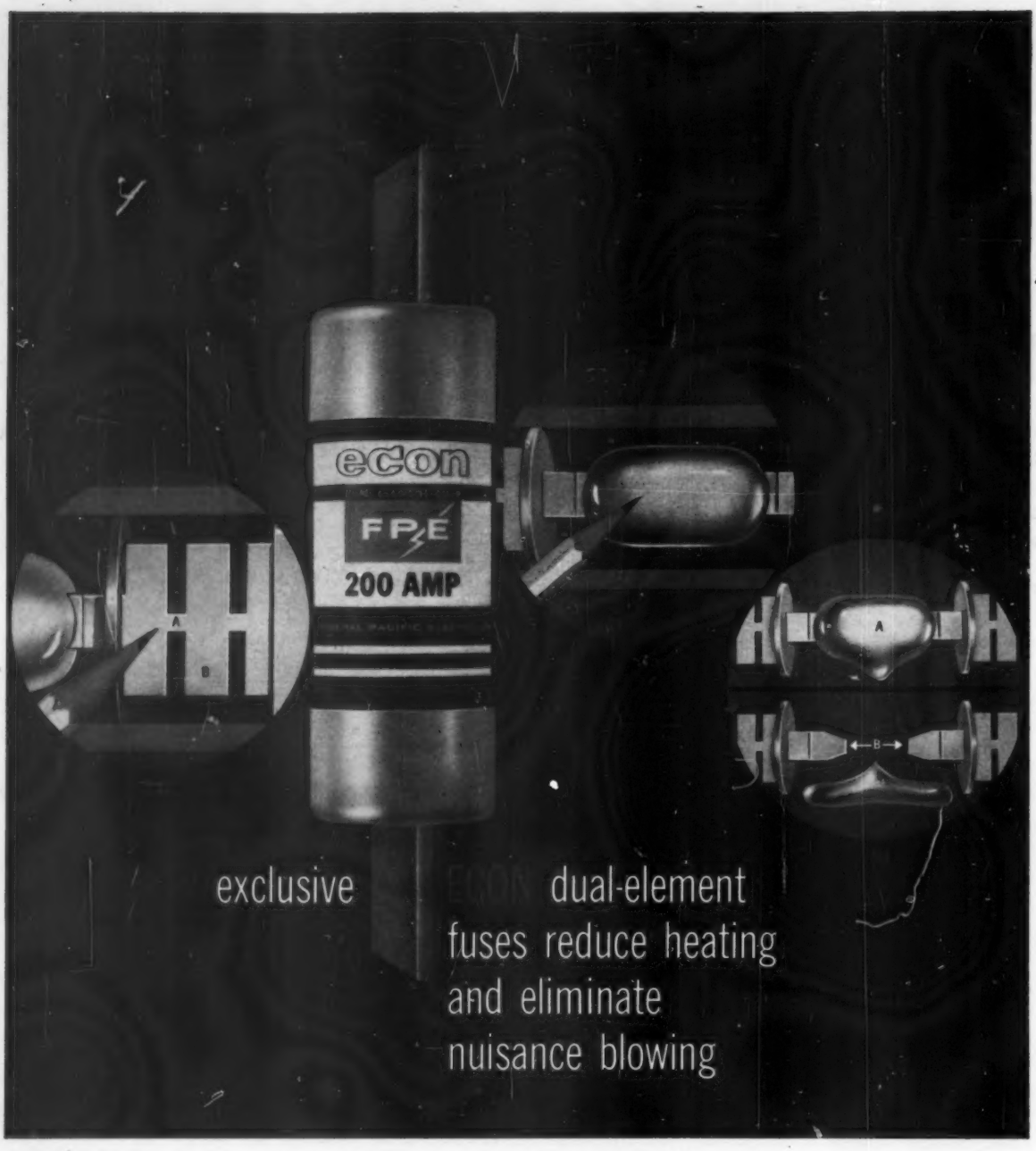
Technical literature and "The Edwards Signal Log" (specifically designed for your use) may be obtained by writing Dept. PE-12, Edwards Company, Inc., Norwalk, Conn. In Canada: Edwards of Canada, Ltd, Owen Sound, Ont.

EDWARDS

SPECIALISTS IN SIGNALING SINCE 1872

Control
Communication
Protection

For more facts circle 628 on Reply Card



Using an exclusive thermal-alloy element which reduces complexity and improves reliability—ECON Dual-Element fuses blow only when they are supposed to blow. You get: Positive protection of equipment...minimum fuse replacement costs...reduced downtime. Loose or corroded connections which cause high temperatures open ECON Dual-Element fuses before the temperature can become destructive. Result—cooler operation. Available in Knife Blade or Ferrule type from 0 to 600 amps, 250 and 600 v. For complete details write: Economy Fuse Division, Federal Pacific Electric Company, Dept. 336, Chicago, Illinois.

1. INSTANTANEOUS ACTION ON SHORT CIRCUITS—Fuse links at either end open the circuit immediately when a dangerous "short" develops. Fuse links (A) melt away instantly causing heavier sections (B) to drop away, completely interrupting circuit.

2. TIMED DELAY ON MOMENTARY OR HARMLESS OVERLOADS—Exclusive ECON-Alloy thermal element takes harmless overloads up to 500%...calibrated delay action prevents needless fuse blowing... unnecessary downtime.

3. QUICK, POSITIVE ACTION ON DANGEROUS OVERLOADS—When overload exceeds predetermined heat and time limits, ECON-Alloy (A) changes instantly from solid to liquid, positively interrupting circuit. NOTICE: EXTRA WIDE GAP (B) PROVIDES "SAFE-BREAK" DISTANCE ...PREVENTS ARCING.

FPE **ECONOMY FUSE DIVISION** CHICAGO, ILLINOIS
FEDERAL PACIFIC ELECTRIC COMPANY

For more facts circle 629 on Reply Card

FIRST CLASS
PERMIT No. 11
BARRINGTON, ILL.

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed In the United States

Postage will be paid by

PLANT ENGINEERING
308 East James St.
BARRINGTON, ILLINOIS

DECEMBER, 1959
This card good only until March 31, 1960

PLANT ENGINEERING

Please have manufacturers send without obligation information or bulletins indicated by numbers circled.

(Please print or typewrite)

Your Name..... Your Title.....

Your Company Name.....

Company Address..... City..... State.....

(Company name must be given. If you prefer delivery at home, also fill below)

Home Address..... City..... State.....

PRODUCTS

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63
64	65	66	67	68	69	70
71	72	73	74	75	76	77
78	79	80	81	82	83	84
85	86	87	88	89	90	91

BULLETINS

101	102	103	104	105	106	107	108	109	
110	111	112	113	114	115	116	117	118	
119	120	121	122	123	124	125	126	127	
128	129	130	131	132	133	134	135	136	
137	138	139	140	141	142	143	144	145	
146	147	148	149	150	151	152	153	154	
155	156	157	158	159	160	161	162	163	
164	165	166	167	168	169	170	171	172	
173	174	175	176	177	178	179	180	181	
182	183	184	185	186	187	188	189	190	
191	192	193	194	195	196	197	198	199	
200	201	202	203	204	205	206	207	208	
209	210	211	212	213	214	215	216	217	

DATA FILE

301	302	303	304	305	306	307	308	309	310	311	312	313	314	315
316	317	318	319	320	321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340	341	342	343	344	345
346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375
376	377	378	379	380	381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400	401	402	403	404	405
406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432	433	434	435
436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465
466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495

ADVERTISED PRODUCTS, SERVICES

501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532
533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564
565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596
597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628
629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692
693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724
725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756

Use this space to ask for tear sheets, other information wanted.

.....

.....

DECEMBER, 1959

This card good only until March 31, 1960

PLANT ENGINEERING

Please have manufacturers send without obligation information or bulletins indicated by numbers circled.

(Please print or typewrite)

Your Name..... Your Title.....

Your Company Name.....

Company Address..... City..... State.....

(Company name must be given. If you prefer delivery at home, also fill below)

Home Address..... City..... State.....

PRODUCTS

1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31	32	33	34	35
36	37	38	39	40	41	42
43	44	45	46	47	48	49
50	51	52	53	54	55	56
57	58	59	60	61	62	63
64	65	66	67	68	69	70
71	72	73	74	75	76	77
78	79	80	81	82	83	84
85	86	87	88	89	90	91

BULLETINS

101	102	103	104	105	106	107	108	109	
110	111	112	113	114	115	116	117	118	
119	120	121	122	123	124	125	126	127	
128	129	130	131	132	133	134	135	136	
137	138	139	140	141	142	143	144	145	
146	147	148	149	150	151	152	153	154	
155	156	157	158	159	160	161	162	163	
164	165	166	167	168	169	170	171	172	
173	174	175	176	177	178	179	180	181	
182	183	184	185	186	187	188	189	190	
191	192	193	194	195	196	197	198	199	
200	201	202	203	204	205	206	207	208	
209	210	211	212	213	214	215	216	217	

DATA FILE

301	302	303	304	305	306	307	308	309	310	311	312	313	314	315
316	317	318	319	320	321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340	341	342	343	344	345
346	347	348	349	350	351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370	371	372	373	374	375
376	377	378	379	380	381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400	401	402	403	404	405
406	407	408	409	410	411	412	413	414	415	416	417	418	419	420
421	422	423	424	425	426	427	428	429	430	431	432	433	434	435
436	437	438	439	440	441	442	443	444	445	446	447	448	449	450
451	452	453	454	455	456	457	458	459	460	461	462	463	464	465
466	467	468	469	470	471	472	473	474	475	476	477	478	479	480
481	482	483	484	485	486	487	488	489	490	491	492	493	494	495

ADVERTISED PRODUCTS, SERVICES

501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532
533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564
565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596
597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628
629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660
661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692
693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724
725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756

Use this space to ask for tear sheets, other information wanted. .....

FIRST CLASS
PERMIT No. 11
BARRINGTON, ILL.

BUSINESS REPLY MAIL

No Postage Stamp Necessary If Mailed in the United States

Postage will be paid by

PLANT ENGINEERING
308 East James St.
BARRINGTON, ILLINOIS

BULLETINS

(Begins on page 21)

140 Turret Drilling—Case histories of turret drilling applications are illustrated and described in this 20-pp bulletin. Discusses principles of turret drilling, and includes photos of tooling and drawings of parts. Brown & Sharpe Mfg. Co.

141 Precision Tools—Catalog 25 contains 96 pp of detailed information on measuring tools and toolroom specialties, optical measuring equipment, gear hobbing and gear testing machinery, as well as precision measuring instruments. Features such items as micrometers, Vernier depth gages, snap gages, protractors, dial indicators, Ultra-Chex gage block sets, height gages, speed indicators, hand tachometers, dynamometers, radius dressers. Scherr-Tumico.

ELECTRICAL LIGHTING

142 Medium Transformers—Bulletin GEA-6984, 12 pp, describes transformers available from company's medium transformer department. Construction features and applications for medium transformers, open and sealed dry-type transformers, distribution equipment transformers and integral distribution centers are included. General Electric Co.

143 Combination Starters—Booklet B-7322, 12 pp, discusses six important safety features of manufacturer's Type L combination safety starters. Type L starters, designed to meet JIC recommendations, are used to control industrial equipment. Also described is "monkey proof" handle mechanism kit available. Westinghouse Electric Corp.

144 On Low-Voltage Switching—Twenty-pp Electrician's Manual RM-610 contains an introduction to low-voltage switching. Tells how company's remote-control switching works electrically, how components are mounted, how to plan a layout, and gives installation instructions. Manual is fully illustrated. Remcon Div., Pyramid Instrument Corp.

145 Pendent Switch—Described in this product brochure is a pendent switch available in a six-station as well as a four-station model. Features an "X-ray" view of the switch both inside and out, and describes advantages. Joy Mfg. Co.

146 Rectifier Power Supplies—Bulletin GEA-6854 describes a line of silicon rectifier power supplies for electrostatic precipitation applications. Design features, characteristics and construction details are covered, and cutaway drawing, comparision chart, dimensional drawings and rating and weight tables are included. General Electric Co.

147 Electric Recorders—Bulletin GEA-6933, 12 pp, provides complete specifications for selection of electric recorders for a variety of applications. Recorders are grouped by accuracy class, and dimensions and chart speeds, operating specifications, applications, features and accessories covered. General Electric Co.

148 Hook-On Volt Ammeter—Bulletin GEA-6292C gives description, specifications and construction details of a pocket-size, hook-on volt ammeters for testing a-c voltages. Lists applications, current ranges, accuracy percentage and operating instructions General Electric Co.

149 Renewable Fuses—The first section of 12-pp Bulletin 1320, discusses construction and application features of two types of renewable fuses—ferrule and knife-blade—as well as renewal links to facilitate replacement. Salient features are highlighted by sectional and cutaway drawings. Ordering information and specifications of the 250-v and 600-v fuses are covered in the catalog's second section. Federal Pacific Electric Co.

150 Crane, Hoist Electrification—Bulletin 76 shows company's trolley busway electrification systems in varied crane and hoist installations. Advantages of the prefabricated units are detailed. Feedrail Corp.

151 Group Relamping Plan—Eight-pp Booklet A-6832 describes a group relamping plan designed to reduce costs, provide better lighting, and cause fewer work interruptions. Sample calculations provide data for setting up a relamping schedule. Westinghouse Electric Corp.

CONSTRUCTION AND MAINTENANCE

152 Grid System Construction—Described in this product bulletin is a concrete construction system utilizing steel grid domes in two-foot modules. Typical safe load tables and layouts of ceilings and floors utilizing the grid construction are included. Grid Flat Slab Corp.

153 Porcelain Enamel Panels—Illustrated and described in this 8-pp bulletin are typical applications of porcelain enamel curtain wall panels in a variety of different constructions. Dimensional data on 16 basic panel types is included. Architectural Porcelain Div., Caloric Appliance Corp.

154 Plywood Sheathing—This illustrated bulletin on WSP Plyscord tells where and how this new sheathing product should be used. Covers use as subflooring, wall sheathing and roof sheathing, and includes property data, recommended working stresses and information on nailing. Douglas Fir Plywood Ass'n.

155 Acoustical Ceiling Tile—This 12-pp booklet describes a fire protective acoustical ceiling tile offering rated fire protection for the floor assembly under which it is installed. Advantages are detailed, installations illustrated. Armstrong Cork Co.

Reader Service Cards for ordering bulletins are on the facing page. Be sure to include your name, job title, and company, even if you want bulletins mailed to your home address.

156 For Food Plant Floors—Described in 8-pp Bulletin 3-2 is a resin cement floor designed specifically to meet demands of the food industry. Construction and application details are covered, and data on range of resistance required in this floor included. Atlas Mineral Products Co.

157 For Construction, Maintenance—This 128-pp pocket-size handbook contains engineering data and specifications to help solve many problems of waterproofing, dampproofing, painting, caulking, roofing and flooring. Included are 36 pp of tables and charts, materials, estimating guide, weights and measures, paint and concrete data. L. Sonneborn Sons, Inc.

158 Moisture Inhibitor—Described in this 6-pp bulletin is an inhibitor that displaces and seals out water and moisture, protects metal surfaces against corrosion, and lubricates, and is designed for use on electrical and electronic equipment. Advantages and applications are detailed, and specifications included. Corrosion Reaction Consultants, Inc.

159 Metal Treatment—Featured in this product bulletin is a metal treatment designed to be applied directly on rusted metal to stop rust action and provide a sound base for maintenance paint. Advantages described. Rusticide Products Co.

160 Products For Maintenance—Featured in this 10-pp bulletin is a variety of products for maintenance applications. These include masking tapes, electrical tapes for wiring, pipe wrap tapes, tapes for sealing duct work joints, marking tapes, wood glue, contact cement and other products. Permacel.

ANNUNCIATOR SYSTEMS

161 Data On Annunciators—Profusely illustrated with photos, charts and diagrams, 52-pp Catalog 100C provides comprehensive information on annunciator systems designed to give immediate notification of off-normal conditions in continuous process and automatic machine operations. Discusses function and applications of annunciators and describes types of annunciator equipment, with mechanical and engineering data included. Panalarm Div., Panellit, Inc.

162 Annunciator Systems—Comhensive information on the operation and application of annunciator systems to provide continuous and automatic surveillance of pipelines, chemical and food processing, power generation and distribution is presented in 36-pp Catalog 659. Various types of annunciator sequences are

BULLETINS

(Begins on page 21)

illustrated and described, annunciator diagrams are included. The Scam Instrument Corp.

163 Recording Annunciator—Bulletin 102A on company's recording annunciator illustrates both large and small systems, printer and the directly readable alpha-numerical digital tape which requires no decoding. Data sheet provided. Panellit, Inc.

Ideas for Plant and Process Automation

164 Data Logging System—Technical data on all functions of the Kybernetes Series 2000 Data System are presented in this 12-pp bulletin, including inputs, d-c amplification, analog-to-digital conversion, linearization, programming, integration, computer control and others. Specifications for all components and functions of the system included. Hagan Chemicals & Controls, Inc.

165 Data Processing Equipment—Preliminary Technical Publication N-07 (1) contains 48 pp of data on company's data processing equipment in use, including digital data processing and analog and digital computing systems. The illustrated bulletin explains types of inputs, input switching, output devices and modes of operation for applications in electric power, other fields. Leeds & Northrup Co.

167 Electronic Computer—Detailed programming information for company's algebraic compiler and translater is presented in 18-pp Manual S-520. Explains the "source" program language—a series of algebraic and logical statements which the programmer will use to define his problem. Royal McBee Corp.

168 Automation Through Modernization—Catalog GED-3893 is designed to serve as a guidebook to automation through modernization for the metal rolling and processing industry. Describes step-by-step approach to automation in detail, covering five basic areas of operation common to all metal-rolling and processing industries—reversing hot mills, hot-strip mills, cold mills, processing lines, and specialized processes. General Electric Co.

169 Cylinders for Automation—Bulletin 91017, 24 pp, describes a line of air, water and oil cylinders and valve-cylinder combinations for automation applications. Features and advantages are detailed, and specifications and dimensional data included. Airmatic Valve, Inc.

OTHER EQUIPMENT

171 Metal Surface Treatment—This 40-pp catalog on metal surface processing (cleaning, washing, rinsing, drying, and spraying, flow and dip coating) illustrates and describes drum-type machines, conveyor machines and systems, combination drum and conveyor machines, monorail machines, complete automatic finishing systems, and barrel finishing equipment. Design features, components and accessories are covered. Ransohoff Co.

172 Fluid Power Equipment—Bulletin 10051-H contains 16-pp of detailed information on fluid power equipment, including pumps, motors, transmissions, servo components, cylinders, and valves. Photos and cutaway views illustrate details of operation and design, and tables list specification data. The Oilgear Co.

173 Cooling Towers—Bulletin KT-104 describes construction, specifications and performance details for cooling towers equipped with a centrifugal-type fan for quiet indoor and/or outdoor operation. Table of ratings is included. American Air Filter Co., Inc.

174 Nylon Stock Shapes—This 8-pp bulletin contains data on nylon stock shapes, covering moisture conditioning, machining, bonding and welding, and coloring of nylon parts. Physical properties are fully detailed. Caddilac Plastic & Chemical Co.

175 Wet Back Boiler—Bulletin B-3232 describes a two-pass unit for heating and power featuring complete wet back construction. Includes design details, specifications and range of sizes, and two supplements to the bulletin—Bulletin B-3232-A and B—give rating data, tables of dimensions and dimensional diagrams. The Titusville Iron Works Co.

176 Chemical Product Review—This 44-pp compilation lists properties and uses of company's industrial, pharmaceutical, and agricultural chemicals currently produced, including established products and developmental items. Features an expanded section on plastics and coatings, as well as sections on oxazolidinones, automatic chemicals and textile fibers. The Dow Chemical Co.

177 Fittings and Hose—Comprehensive data on brass and steel tube fittings, tube working tools, hose, hose ends and assemblies most frequently used in hydraulic and pneumatic systems is presented in 16-pp Catalog C-301. Tables list complete selection data. The Weatherhead Co.

178 Foundry Exhaust Hoods—Bulletin 270-E2A is a 28-pp manual of exhaust hood designs for the foundry industry, with installation photos illustrating applications in foundry shakeouts, melting furances, grinding and abrasive sawing, swing frame grinding, abrasive cleaning and tumbling, sand handling and conditioning. Typical foundry dust control system, dust control equipment covered. American Air Filter Co.

Current Publications Of Special Interest

179 Metal Cleaning Solvents—Form 124, a 12-pp guide to more efficient cleaning of metal products, presents detailed information on several solvents. These include chlorothene for safer maintenance and production cleaning; three trichloroethylene solvents, Neu-Tri for great stability, Alk-Tri, for easy quality control, and Hi-Tri for high purity; industrial perchloroethylene for longer cleaning action, less corrosion of light metals, low solvent losses; and non-flammable, low toxicity methylene chloride for fast stripping. The Dow Chemical Co.

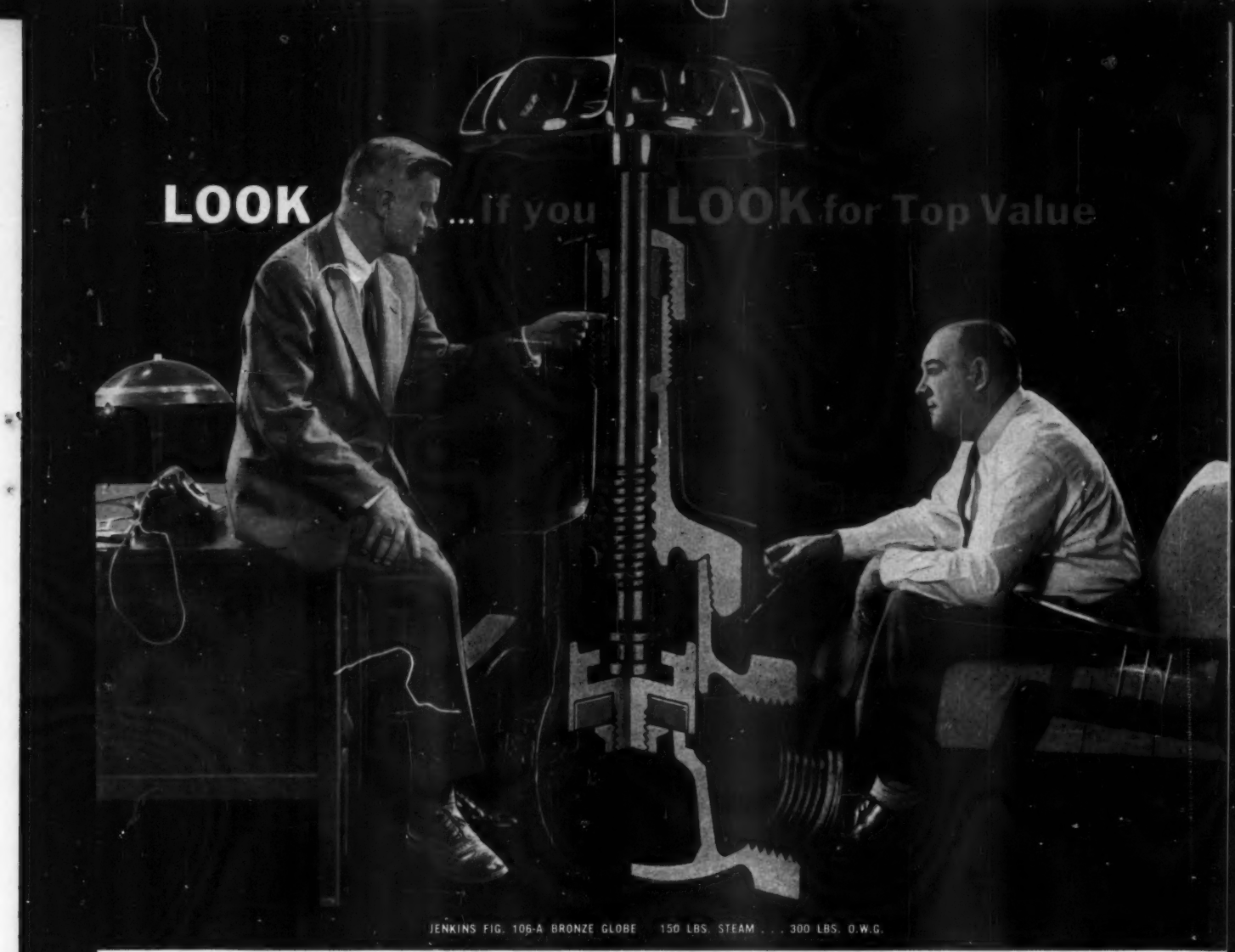
180 Plant Layout Models—This 12-pp bulletin describes applications and savings that can be realized from the use of models in plant layout work. All phases of the model design and construction are shown including how to estimate cost of model. Visual Plant Layouts, Inc.

181 Air-Hydraulic Boosters—Featured in 24-pp Bulletin B-200P are air-hydraulic boosters designed to convert shop air into intensified hydraulic pressures for operating hydraulic cylinders and other hydraulically operated devices. Discusses such questions as when to use boosters in place of pumps and large bore air cylinders, and includes chart for booster selection, simplified mechods for calculating boosters, mounting. Miller Fluid Power Div., Flick-Reedy Corp.

182 Electrical Insulating Varnish—This 36-pp catalog covers selection and application of electrical insulating varnishes with complete details on all electrical and mechanical properties as well as operating temperature limitations. Includes charts, graphs and illustrations on temperature conversion, solvents, specific gravity, viscosity, also specifications. Minnesota Mining and Mfg. Co.

183 Deaerating Heaters—Eight-pp Bulletin WC-101C discusses principles of deaeration, deaerator operation, standard designs available, design features and accessory equipment. It is illustrated with drawings and photos of typical installations. Graver Water Conditioning Co.

184 For Process Industries—Twelve-pp Catalog 978 presents a quick panoramic view of manufacturer's line of process equipment. Feeders, conveyors, coolers, dryers, weigh feeders, vibrating screens, bin check valves, magnetic separators are outlined. Well illustrated with photos and drawings, booklet includes brief data. The Jeffrey Mfg. Co.



JENKINS FIG. 106-A BRONZE GLOBE 150 LBS. STEAM . . . 300 LBS. O.W.G.

in Disc Equipped Bronze Valves

LOOK at that Wheel — Tough malleable iron. Design unequalled for cool, sure grip.

LOOK at the Index Plate — Has Fig. No. etched in green background. Held by wheel nut which is secured by rolled-over spindle end.

LOOK at that Spindle — Made of high tensile bronze. See how much heavier it is . . . how many more deeply cut threads engage bonnet. And, the crowned head that reduces friction on disc holder. Sure, it costs more to make a spindle this way. But it reduces wear, preserves packing, means easier operation.

LOOK at the Packing Nut and Gland—Note the heavy and deep bronze hex. And, that bronze gland designed to compress packing toward spindle.

LOOK at that Packing Box — Its depth equals 1½ times spindle diameter. More packing space means less repacking. An asbestos, lubricated and graphited packing is used.

LOOK at that Bonnet — One-piece, screw-over design with big hex surfaces is easy to remove. Take an extra look at the bevel joint between bonnet and body, serving as an internal brace against the crushing effect of the bonnet assembly. Millions of Fig. 106-A in use for years prove this unique design licks distortion and springing.

LOOK at the Disc Holder — It's the Slip-on Stay-on type originated by Jenkins. Correct protective depth prevents flaking or cracking of disc.

LOOK at the Disc — Easily renewed without removing valve from line. Made of compositions to suit various services . . . and **made by Jenkins**, the only maker of both valves and discs.

LOOK at that Body — Just compare wall thickness of this high tensile bronze body with any other valve. The factor of safety is many times higher than rating requires. See the curved diaphragm to protect seat from distortion by pipe strain. Note that the raised seat is higher to permit more reseating operations . . . and wider, so it won't cut into disc. Pipe threads are full length and clean cut.

LOOK at this . . . for Throttling

—Just replace the standard disc nut with this Throttling Nut and a Fig. 106-A becomes well-suited to throttling service. This unique nut reduces the effects of wire drawing and its long legs restrict flow for accurate control. Many plants take advantage of this versatile valve to reduce valve and parts inventory.

THE FIRST renewable composition disc valve was a Jenkins Valve, originated nearly a century ago. Compare today's Fig. 106-A Bronze Globe with any other. See why so many valve users agree that a *Jenkins* is still the FIRST for top value. For descriptive folder No. 189-B on the full line of Jenkins Bronze Globe, Angle and Check Valves write to Jenkins Bros., 100 Park Avenue, New York 17.

JENKINS VALVES

For more facts circle 630 on Reply Card

SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 215 and 216.

MECHANICAL POWER TRANSMISSION

301 **Fluid Drive**—Eight-pp Bulletin 9819 describes and illustrates adjustable speed Gyrol fluid drives, 1- through 25-hp, giving advantages and applications. Components and operation are also covered in detail. Industrial Div., American-Standard.

302 **Flange Mounted Drives**—Bulletin 7140 contains selection data for flange mounted drives for a variety of applications. A load classification table is included, as well as tables of minimum sheave pitch diameters, load location factors, overhung load capacities. The Falk Corp.

303 **Mechanical Drive**—Six-pp Bulletin 3600 describes the Allispede mechanical adjustable speed drive which operates on a-c power, offers speed ranges up to 8:1, ratings from 1 to 30 hp. Gives engineering and applications information. Illustrates modifications to the basic drive—remote controls, mounting flanges, etc. Graphs show speed regulation benefits gained by using a synchronous induction motor in the drive. The Louis Allis Co.

304 **Transmission Belting**—Application information on company's line of transmission belting is presented in 16-pp Bulletin S-5174. Specific types of belting for a variety of applications is illustrated and described, and technical data tables, and a selection table for drives included. The Goodyear Tire & Rubber Co.

305 **Mill Bearings**—Eight-pp Book 2665 describes company's line of mill bearings with heavy duty, self-aligning roller bearings and steel housings. Dimensional data and diagrams are provided. Link-Belt Co.

306 **Anti-Friction Bearings**—Catalog 424-B entitled "The broadest line in the anti-friction field," is an 8-pp folder giving capsule presentation of company's entire product line. A brief description of each product is provided. SKF Industries, Inc.

307 **Flexible Couplings**—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings for power transmission. Tells advantages of these couplings. Thomas Flexible Couplings Co.

CONSTRUCTION

308 **Foundation Pipe Piles**—Comprehensive information on Taylor Forge spiral-weld foundation pipe piles is presented in 24-pp Form F-5677. In addition to detailed specifications, the illustrated booklet describes a number of pipe-pile installations and includes driving logs. L. B. Foster Co.

309 **Open Web Joists**—Standard and long span open web steel joists are illustrated and described in this 38-pp catalog. Advantages of the steel joist construction are detailed, and sections are included on design calculation, properties and dimensions. United States Steel Corp.

310 **Underpasses, Conduits**—Manual TL-5856 is a 16-pp book explaining practical applications of underground passageways, their design and construction. Condensed data are given, as are drawings. Armco Drainage & Metal Products, Inc.

311 **Replacement Glazing**—Twelve-pp Booklet PL-251 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic, Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems, this practical booklet gives properties of this sheet. Plastic Dept., Rohm & Haas Co.

312 **Unit Wall Construction**—Twelve-pp Technical Bulletin UW-100-5 describes and illustrates application of company's Uniwall for complete single unit, moderate cost, wall construction in buildings of all types. The bulletin contains construction details. Natco Corp.

313 **Fir Plywood**—This 34-pp construction guide contains full-page structural drawings providing basic information on types, grades, and applications of fir plywood. Booklet covers information on floor construction. Douglas Fir Plywood Assn.

314 **Aluminum in Colors**—This bulletin introduces Alcoa's Alumalure colored aluminum architectural building sheet products, a complete line of sheet products offered in 11 colors. Aluminum Co. of America.

315 **Steel Floor Plate**—Skid resistance and other advantages of USS multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, load data. United States Steel Corp.

316 **Non-Slip Flooring**—Algrip, an abrasive rolled steel floor plate described as non-slip even on steel inclines, is the subject of Booklet AL-29, 8-pp. Discusses safety features. Alan Wood Steel Co.

317 **Industrial Doors**—Features and advantages of company's automatic industrial doors illustrated and described in 8-pp Catalog 159. Dimensional drawings and photos showing details of design and operation given. Clark Door Co., Inc.

318 **Wire Mesh Partitions**—Advantages of company's wire mesh partitions for closing off restricted areas are told in this product bulletin. Specifications are included, as well as photos. Phoenix Wire Works, Inc.

PACKINGS, SEALS

320 **Piston Packing**—Sixteen-pp Bulletin 5903 presents engineering data on Darcova Pumcups for packing pistons of air cylinders, hydraulic cylinders and reciprocating pumps. Included are operating diagrams and a list of typical installations, as well as helpful data on Pumcup compositions. Darling Valve & Mfg. Co.

321 **Metal Packing**—Featured in 24-pp Form AD-166 is detailed information on selection of metal packings for use wherever gas or air is compressed or expanded. Covers free-floating metal packings, metal rod packing rings, metal scraper rings, metallic packings. The Garlock Packing Co.

322 **Mechanical Seals**—The successful sealing of slurries with company's mechanical seals is fully detailed in Technical Bulletin CP-580. Factors to consider and complete selection details are included. Chemical & Power Products, Inc.

INSTRUMENTS, CONTROLS

323 **Precision Instruments**—Catalog G1 contains 32-pp of comprehensive information on indicating, recording and controlling instruments. Contains potentiometers, pyrometer supplies, descriptive and illustrative data on systems and components, null indicators, amplifiers and oscillographs, pressure gages, flow and liquid level meters, pneumatic remote transmission, thermometers, panelboards, valves, diaphragm motors, motor and dampers, switches, etc. Minneapolis-Honeywell Regulator Co.

324 **Production Control System**—Versatility of company's visible record systems in production control is illustrated and described in this 12-pp Bulletin SB-66. How various types of visible record forms guide decisions—from sales records and market analysis, through engineering design, purchasing, cost, tool and die, shop parts and materials stores, production and scheduling—is pictorially presented. Acme Visible Record, Inc.

325 **Automatic controls**—Catalog 26 comprises 52 pages which describe and illustrate electric thermostats, pressure controls, humidistats, motor-operated valves, temperature regulators, motor operators, unit ventilator controls, hot water controls, electronic controls, control centers and accessories. Operational and application data is incorporated with the descriptions. Barber-Colman Co.

TOUGH BUYERS DEMAND REZNOR FIVE-WAY HEATERS

to project heat where needed on "difficult" jobs... with no waste!

When cranes, production machinery or huge inventory stacks require abnormally high heater placement, you *have* to be a "tough buyer" to do a proper heating job! You have to order a unit that will project heat right where it's needed . . . with no waste of fuel *or* heat. That's why so many plant engineers now demand the new Reznor Five-Way Heater, which projects heat downward, even from a height of 40 feet, to the spot where heat is needed, and (with the optional 5-way diffuser) in as many as five directions at once!

LOWER FUEL COSTS—By spotting heat accurately, the Five-Way Heater maintains complete comfort with less fuel; keeps fuel bills low.

LOWER INSTALLATION COSTS—The entire assembly installs quickly, requiring only gas, flue and power connections.

Available with aluminized or stainless steel heating elements and gas modulation. Electric ignition is optional.

For information, phone your Reznor distributor, or write Reznor Manufacturing Co., Dept. 91C, Mercer, Pa.

For more facts circle 631 on Reply Card

The heating world is full of tough buyers; that's why Reznor is the world's largest selling direct-fired heater!

REZNOR HEATERS

"THE TOUGH BUYERS' LINE"

DATA FILE

(Begins on page 220)

326 Performance Meter—Bulletin K15A illustrates and describes a direct-reading performance meter for diesel, gasoline, natural gas, and steam engines. Construction and principle of operation are detailed and internal works are shown on cutaway. The Korfund Co., Inc.

328 For Limited Panel Space—Bulletin 532 describes Model 216 indicator used with company's automatic tank contents gage. Bulletin contains a full illustration of indicator which, although occupying a small space, has a scale 20 in. long. The Liquidometer Co.

329 Meters, Regulators, Valves—Bulletin C-5000, 28-pp, describes and illustrates meters, regulators and valves for a wide range of services. They include gas meters, gas pressure regulators, industrial meters, water meters. Information includes application suggestions, specifications and references to more detailed product literature. Rockwell Mfg. Co.

330 Gages, Needle Valves—Catalog 76-G consists of a loose-leaf bound collection of literature on gages and needle valves. Various types of gages are illustrated and described, with applications and specifications fully detailed. Marsh Instrument Co.

331 Dial Thermometers—Catalog 205 contains 12-pp of illustrated data on features and characteristics of a line of dial thermometers for industrial applications. Complete dimensional and specification data is included. United States Gauge, Div. American Machine and Metals, Inc.

332 Electronic Counters—Featured in this product bulletin is a line of high speed electronic counters. Various types of counters are illustrated and described and engineering details furnished. Veeder-Root Inc.

333 Graphic Instruments—How to make plant surveys with graphic instruments is the subject of 8-pp Bulletin 856. Advantages of systematic surveys with electrical recording instruments are detailed, types of instruments needed are described, and studies to be made are outlined. The Esterline-Angus Co., Inc.

334 Sound Measuring Equipment—Bulletin 797-E contains 16 pp of detailed information on a line of sound-measuring equipment, including sound-level meters, vibration meters, analyzers and accessories. Typical applications in a variety of industries illustrated. General Radio Co.

DUST, FUME CONTROL

336 Dust Collectors—Cabinet cloth filter dust collectors are featured in this series of information bulletins. Photos illustrate internal design and typical applications of the compact, efficient collectors. Multiple rating tables, specifications and dimensional drawings included. Torit Mfg. Co.

337 Dust and Mist Collectors—Illustrated and described in this fold-out, chart-size bulletin is company's line of dust and mist collectors and accessory equipment. Detailed specifications are included, as well as application photos. Aget Mfg. Co.

338 Dust Control Systems—Bulletin 104, 36-pp, on company's dust filters, gives detailed information about dust control systems and how to engineer them. Includes description of the Roll-Clean Dynaclone dust filter, as well as information, capacities and dimensions for other dust filters. The W. W. Sly Mfg. Co.

339 Dust and Fume Control—Applications of company's dust and fume control systems in ceramic, foundry, grain, metal, steel and wood industries are illustrated and described in 50-pp Bulletin PE1-2. Design and specification data on centrifugal collectors and units are included. The Kirk & Blum Mfg. Co.

ELECTRICAL

341 Rerated Integral HP Motors—Bulletin 520 describes polyphase open-protected motors in re-rated NEMA frames. Ratings to 200 hp. Motor Div., Robbins & Meyers, Inc.

343 Unit Substations—Tranfo-Units—packaged, compact unit substations—are described in 16-pp Bulletin 5604-1A. Provides basic design, application and specification information of value in selecting integrated combinations of equipment. Consisting of transformer with primary and secondary switchgear, these units permit voltage step-downs at the load area. Ratings, dimensions, weights and outline drawings of 16 types of Tranfo-Units, specifications provided. I-T-E Circuit Breaker Co.

344 Panelboards—Tumbler switch and plug fuse panelboards are featured in this product Bulletin 307. Table of catalog numbers, ratings and sizes is included, as well as typical wiring diagrams, operating information and specifications. Frank Adam Electric Co.

345 Switch Wiring Diagrams—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters are used. Allen-Bradley Co.

346 Molded Case Breakers—Features and advantages of company's molded case circuit breakers are illustrated and described in 28-pp Bulletin GEA-6754. A cutaway view tells the inside story of circuit breaker design, and complete selection data, including section on determining ampere rating, is furnished. General Electric Co.

347 Distribution Equipment—Detailed information on company's line of electrical distribution equipment is presented in 82-pp '59 Marketeer, Catalog M-159. Among equipment described are Electrostrip multi-outlet assemblies, switches, lighting panelboards, power panelboards, switchgear assemblies, and various types of electrical duct. Tables of essential data. BullDog Electric Products Co., Div. I-T-E Circuit Breaker Co.

348 Electrical Equipment—Twelve-pp pictorial Bulletin 2706 describes fabrication and applications of company's electrical equipment, including conduit fittings, electrical equipment enclosures and devices, floodlights and traffic control. Photos show installations. Crouse-Hinds Co.

349 Electrical Equipment Digest—Electrical equipment illustrated and described in 160-pp Catalog Digest 142, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

350 Armored Cable—Advantages, characteristics and construction of interlocked armored cable are detailed in this product bulletin. Types of insulation are described and illustrated. General Cable Corp.

352 Higher Voltage Cable—Eight-pp Bulletin RCT 700 covers the subject of polyethylenes for higher voltage cables. Polyethylene insulation, characteristics, sheath characteristics, cable design, manufacture and specifications and installation are covered. Rome Cable Corp.

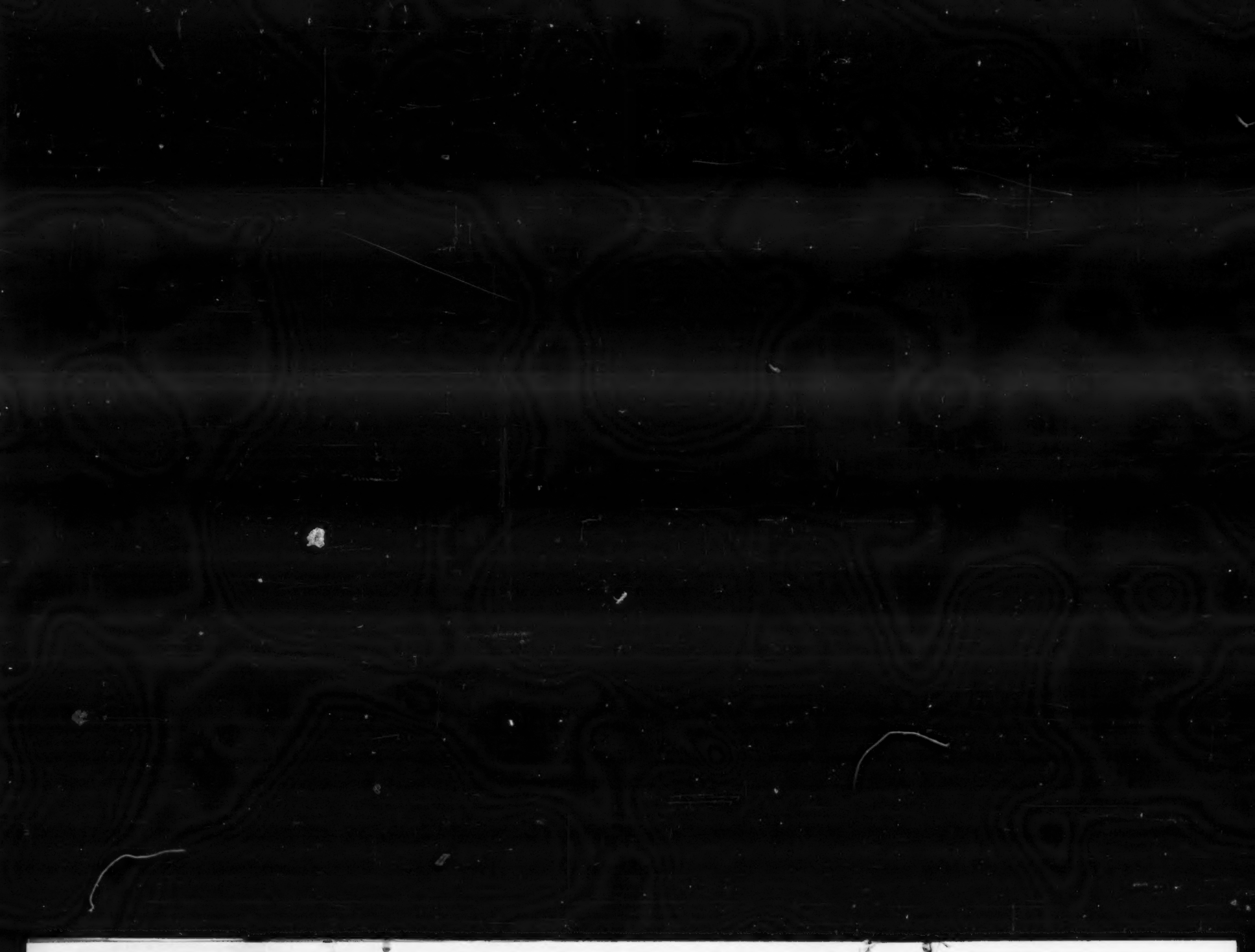
353 Portable Electrical Cable—Detailed information on portable electrical cable for a variety of industrial applications is presented in this condensed catalog. Basic construction covered. Western Insulated Wire Co.

354 Wiring Devices—Catalog 60, about 80-pp, presents ordering data on wiring devices including a wide range of switches, convenience outlets, lampholders, fluorescent devices, cord connectors, adapters, wall plates, accessories etc. Fully illustrated with photos, catalog provides condensed information on features, dimensions, applications. Pass & Seymour, Inc.

355 Cable Troughs—This 12-pp catalog offers a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings, horizontal elbows, inside and outside vertical elbows, ties, crosses, covers and many special devices. The Globe Co.

357 Dual-Element Fuses—Advantages offered by company's dual-element cartridge fuses are detailed

For more facts circle 632 on Reply Card



DATA FILE

(Begins on page 220)

326 Performance Meter—Bulletin K15A illustrates and describes a direct-reading performance meter for diesel, gasoline, natural gas, and steam engines. Construction and principle of operation are detailed and internal works are shown on cutaway. The Korfund Co., Inc.

328 For Limited Panel Space—Bulletin 532 describes Model 216 indicator used with company's automatic tank contents gage. Bulletin contains a full illustration of indicator which, although occupying a small space, has a scale 20 in. long. The Liquidometer Co.

329 Meters, Regulators, Valves—Bulletin C-5000, 28-pp, describes and illustrates meters, regulators and valves for a wide range of services. They include gas meters, gas pressure regulators, industrial meters, water meters. Information includes application suggestions, specifications and references to more detailed product literature. Rockwell Mfg. Co.

330 Gages, Needle Valves—Catalog 76-G consists of a loose-leaf bound collection of literature on gages and needle valves. Various types of gages are illustrated and described, with applications and specifications fully detailed. Marsh Instrument Co.

331 Dial Thermometers—Catalog 205 contains 12-pp of illustrated data on features and characteristics of a line of dial thermometers for industrial applications. Complete dimensional and specification data is included. United States Gauge, Div. American Machine and Metals, Inc.

332 Electronic Counters—Featured in this product bulletin is a line of high speed electronic counters. Various types of counters are illustrated and described and engineering details furnished. Veeder-Root Inc.

333 Graphic Instruments—How to make plant surveys with graphic instruments is the subject of 8-pp Bulletin 856. Advantages of systematic surveys with electrical recording instruments are detailed, types of instruments needed are described, and studies to be made are outlined. The Esterline-Angus Co., Inc.

334 Sound Measuring Equipment—Bulletin 797-E contains 16 pp of detailed information on a line of sound-measuring equipment, including sound-level meters, vibration meters, analyzers and accessories. Typical applications in a variety of industries illustrated. General Radio Co.

DUST, FUME CONTROL

336 Dust Collectors—Cabinet cloth filter dust collectors are featured in this series of information bulletins. Photos illustrate internal design and typical applications of the compact, efficient collectors. Multiple rating tables, specifications and dimensional drawings included. Torit Mfg. Co.

337 Dust and Mist Collectors—Illustrated and described in this fold-out, chart-size bulletin is company's line of dust and mist collectors and accessory equipment. Detailed specifications are included, as well as application photos. Aget Mfg. Co.

338 Dust Control Systems—Bulletin 104, 36-pp, on company's dust filters, gives detailed information about dust control systems and how to engineer them. Includes description of the Roll-Clean Dynaclone dust filter, as well as information, capacities and dimensions for other dust filters. The W. W. Sly Mfg. Co.

339 Dust and Fume Control—Applications of company's dust and fume control systems in ceramic, foundry, grain, metal, steel and wood industries are illustrated and described in 50-pp Bulletin PE1-2. Design and specification data on centrifugal collectors and units are included. The Kirk & Blum Mfg. Co.

ELECTRICAL

341 Rerated Integral HP Motors—Bulletin 520 describes polyphase open-protected motors in re-rated NEMA frames. Ratings to 200 hp. Motor Div., Robbins & Meyers, Inc.

343 Unit Substations—Tranfo-Units—packaged, compact unit substations—are described in 16-pp Bulletin 5604-1A. Provides basic design, application and specification information of value in selecting integrated combinations of equipment. Consisting of transformer with primary and secondary switchgear, these units permit voltage step-downs at the load area. Ratings, dimensions, weights and outline drawings of 16 types of Tranfo-Units, specifications provided. I-T-E Circuit Breaker Co.

344 Panelboards—Tumbler switch and plug fuse panelboards are featured in this product Bulletin 307. Table of catalog numbers, ratings and sizes is included, as well as typical wiring diagrams, operating information and specifications. Frank Adam Electric Co.

345 Switch Wiring Diagrams—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters are used. Allen-Bradley Co.

346 Molded Case Breakers—Features and advantages of company's molded case circuit breakers are illustrated and described in 28-pp Bulletin GEA-6754. A cutaway view tells the inside story of circuit breaker design, and complete selection data, including section on determining ampere rating, is furnished. General Electric Co.

347 Distribution Equipment—Detailed information on company's line of electrical distribution equipment is presented in 82-pp '59 Marketeer, Catalog M-159. Among equipment described are Electrostrip multi-outlet assemblies, switches, lighting panelboards, power panelboards, switchgear assemblies, and various types of electrical duct. Tables of essential data. BullDog Electric Products Co., Div. I-T-E Circuit Breaker Co.

348 Electrical Equipment—Twelve-pp pictorial Bulletin 2706 describes fabrication and applications of company's electrical equipment, including conduit fittings, electrical equipment enclosures and devices, floodlights and traffic control. Photos show installations. Crouse-Hinds Co.

349 Electrical Equipment Digest—Electrical equipment illustrated and described in 160-pp Catalog Digest 142, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

350 Armored Cable—Advantages, characteristics and construction of interlocked armored cable are detailed in this product bulletin. Types of insulation are described and illustrated. General Cable Corp.

352 Higher Voltage Cable—Eight-pp Bulletin RCT 700 covers the subject of polyethylenes for higher voltage cables. Polyethylene insulation, characteristics, sheath characteristics, cable design, manufacture and specifications and installation are covered. Rome Cable Corp.

353 Portable Electrical Cable—Detailed information on portable electrical cable for a variety of industrial applications is presented in this condensed catalog. Basic construction covered. Western Insulated Wire Co.

354 Wiring Devices—Catalog 60, about 80-pp, presents ordering data on wiring devices including a wide range of switches, convenience outlets, lampholders, fluorescent devices, cord connectors, adapters, wall plates, accessories etc. Fully illustrated with photos, catalog provides condensed information on features, dimensions, applications. Pass & Seymour, Inc.

355 Cable Troughs—This 12-pp catalog offers a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings, horizontal elbows, inside and outside vertical elbows, ties, crosses, covers and many special devices. The Globe Co.

357 Dual-Element Fuses—Advantages offered by company's dual-element cartridge fuses are detailed

For more facts circle 632 on Reply Card

RYKON *Grease*

passed this test at Corn Products Company

Situation: The springs in the grease chargers on expeller machines at Corn Products Company's Argo, Illinois, plant are under extra heavy tension. Due to this tension, oil formerly separated from the grease thickener in the grease cups. Bearings did not receive proper lubrication and the cups filled with grease thickener residue. The system needed cleaning every three months. Each time, large amounts of residue were found. Ten special-purpose greases were tried in an effort to solve the problem.

What was done: A Standard Oil lubrication specialist working with Corn Products' plant maintenance people recommended RYKON Grease #2 E.P. The system now needs cleaning only every six to nine months. Very little residue is found. Now RYKON Grease has become one of the important lubricating greases in use at Corn Products' Argo plant.

RYKON Grease is formulated with a unique non-soap organic thickener. The fibers of this thickener hold RYKON's fine quality base oil firmly in suspension. The grease resists water washing, high temperature and dirt contamination while providing superior lubrication to bearings of all types.

What you can do: Get more facts about RYKON Grease from the Standard Oil office nearest you anywhere in the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago 80, Ill.**

You expect more from **STANDARD** *and you get it!*

Standard's Arnold Parus and chief lubrication foreman Henry Anderson take a look at expeller unit's grease system. Arnold Parus is well equipped through experience and training to work with plant men on lubrication problems. Arnold has a B.S. degree from Bradley University and three years' field experience in this kind of work. He has also completed Standard's Sales Engineering School.

Quick facts about **RYKON** *Grease*

- Heat stable. At sustained high temperatures, RYKON Grease remains soft and grease-like.
- Resistant to water washing.
- Mechanically stable. Minimum change in consistency in service.
- Resistant to oxidation. Thickener acts as inhibitor.
- Exceptional rust preventive properties.

MOUNTING GLAND
Eliminated
ON
CHEMPRO
"Wedge-Lock"
mechanical seals

The Chempro line of external "wedge-lock" seals does not require a mounting gland, or any modification to the stuffing box, to align and hold the Chempro seal in position. The patented "wedge-lock" design automatically seats the seal stator in the stuffing box in perfect face-to-face alignment with the seal rotor on the shaft. Simple and easy to install—*in only 20-30 minutes.*

OTHER ADVANTAGES

- Completely Interchangeable with Packing
- Simple in Design—Only 8 Parts
- Chempro Teflon* Shaft Packing—Chemically Inert
- External Seals Adjustable After Installation
- Parts Interchangeable Between Seal Styles
- External and Internal Seals Available—From Vacuum to 100 psi

*du Pont trademark

Write for Bulletins CP551 and 575

CHEMICAL & POWER PRODUCTS, Inc.

7 Broadway, New York 4, N. Y.

For more facts circle 633 on Reply Card

224

DATA FILE

(Begins on page 220)

in 12-pp Bulletin 1330. Describes knife-blade and ferrule types, and includes time current curves and other data. Economy Fuse Div., Federal Pacific Electric Co.

LIGHTING, COMMUNICATION

358 Lamp Data—Incandescent and fluorescent lamps are featured in this 16-pp bulletin. Selection tables list complete descriptive and electrical details. Champion Lamp Works.

359 Communication System—Featured in this bulletin is a transistorized communication system designed to provide communication between two or more persons or departments regardless of distance or surrounding noise conditions. Operating and equipment features are detailed. Gai-Tronics Corp.

360 Signal Log—Featured in this 44-pp "signal log" is a line of signal systems and devices, including fire alarms and warning systems, burglar alarms, thermostatic controls, intercoms, annunciators, buzzers, door openers, and clock and call combinations. Advantages for industry are detailed. Edwards Co., Inc.

PUMPS, COMPRESSORS

362 Free Flowing Pumps—Bulletin P10-B44 describes features and varied materials handling applications of company's Torque-Flow pump. Applications in the coal, pulp and paper, and chemical industries are used to show how the design principles of this pump makes it non-clogging, abrasion resistant, yet gentle. Western Machinery Co.

363 Centrifugal Pumps—Advantages of cradle-mounted centrifugal pumps are detailed in 20-pp Form 7223-B. A cutaway view illustrates performance features and tables list dimensions and specifications. Cameron Pump Div., Ingersoll-Rand Co.

364 Rotary Air Products—Application ideas for company's line of air motors, air compressors and vacuum pumps are illustrated in 12-pp Bulletin APP-459. Photos and diagrams show details of operation and design. Gast Mfg. Co.

365 Oil-Free Compressors—Heavy-duty industrial oil-free compressors are featured in 12-pp Bulletin A-44. Component parts are illustrated and described, and internal construction is shown on cutaway. Joy Mfg. Co.

366 Water-Cooled Compressors—Featured in 12-pp Bulletin WB10 are two-stage water-cooled air compressors designed to meet the demand for small machines having efficiencies comparable to those of large two-stage horizontal compressors. Cutaway views showing component features are included, as well as general data tables. Gardner-Denver Co.

VALVES, TRAPS, PIPING AND FITTINGS

368 Stainless Steel Valves—Corrosion resistant stainless steel valves are featured in 32-pp Catalog 59SS. Features of design and construction are shown through cutaway views, and advantages of stainless steel in withstanding corrosive attack of chemicals and atmospheres are detailed. Jenkins Bros.

370 Steam Trap Primer—Fundamental facts about drainage and steam trap operation are presented in this 16-pp steam trap primer. Operating principles of steam traps are fully detailed, and data on steam trap maintenance and application included, as well as question-and-answer section covering common steam trap problems. Barnes & Jones Inc.

371 Impulse Steam Traps—Bulletin T1744 describes a line of impulse steam traps designed for light condensate load requirements. Operation is detailed, and capacities, dimensions tabulated. Yarnall-Waring Co.

372 Steam Trap—Bulletin 257-B describes features and operation of a steam trap which uses the kinetic energy of steam to close the valve. Operation details are illustrated and capacities tabulated. Sarco Co., Inc.

373 On Steam Traps—Catalog K is an enlarged 48-pp manual and steam trap catalog. New material provided includes open float and thermostatic traps, pipe strainer to 6 in. in steel and semi-steel, and helpful steam pipe sizing tables. Discusses fundamentals of good trapping, trap selection, installation, testing, repairs. Armstrong Machine Works.

374 PVC Pipe, Fittings—This 12-pp bulletin contains latest technical information on polyvinyl chloride pipe and fittings, including advantages and properties, general characteristics and applications, physical flow rate charts and complete specifications. Also included is a chemical resistance chart of various reagents and their effect. Mueller Brass Co.

375 UPVC Pipe, Fittings—Technical data and installation information on unplasticized polyvinyl chloride pipe are provided in 24-pp Booklet TTP-119. Also gives specifications for threaded and socket types of UPVC fittings, valves and flanges, of normal and high-impact material. Tube Turns Plastics, Inc.

376 Glass Pipe and Fittings—Corrosion-resistant qualities of this Pyrex brand glass pipe and fiittings which make it suitable for use under corrosive conditions are described in 44-pp Bulletin PE-3. Operating temperatures, physical characteristics, installation procedures are covered and specifications and dimensional drawings given. Corning Glass Works.

One slip can cost more than USS Multigrip...

What percentage of occupational accidents is caused by falls? In one state, falls were responsible for 17 per cent of all injuries, 33 per cent of the days lost and 23 per cent of the direct cost. (From National Safety News, February, 1959.) Falls ranked No. 1 as the cause of most accidents.

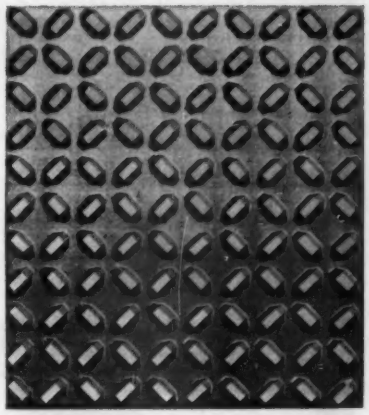
Fortunately, you can do something to prevent falls by installing USS Multigrip. Multigrip floor plate provides safe traction in any direction. It is studded with little cleats that are flat on top and do not catch the shoe.

For dangerous locations such as machine shops, loading platforms, stair treads and catwalks, USS Multigrip supplies safety plus.

Saves money, too! Where floors take a pounding from heavy traffic, Multigrip will stand for years under constant use. There's little or no maintenance.

On your next inspection trip, search out the hazardous locations—and make them safe with USS Multigrip.

USS is a registered trademark



Sold by leading distributors from coast to coast.

United States Steel Corporation—Pittsburgh
Tennessee Coal & Iron—Fairfield, Alabama
Columbia-Geneva Steel—San Francisco
United States Steel Supply—Steel Service Centers
United States Steel Export Company

United States Steel

For more facts circle 634 on Reply Card

PAGE CHAIN LINK FENCE

Fence value depends on
—quality materials
—quality installation
You get both from PAGE

New Aluminized Fabric!
(other quality fabrics available:
galvanized steel,
aluminum,
stainless steel)

8 basic fence designs
6 gate styles

Expert installation
by specialists

Registered Certificate
of Quality furnished
to property owner

Good fences—since 1883

Write for helpful booklet

PAGE FENCE ASSOCIATION
National Headquarters • Monessen, Pa.

A product of Page Steel & Wire Division
American Chain & Cable Company, Inc.

For more facts circle 635 on Reply Card

DATA FILE

(Begins on page 220)

377 **Process Piping**—Chemical-resistant plastic pipe, fittings and valves are featured in 16-pp Bulletin CE-80. Advantages are detailed, and installation procedures outlined. Technical data tables are also included. American Hard Rubber Co.

378 **Reinforced Plastic Pipe** — Detailed information on characteristics and applications of reinforced plastic pipe is presented in this 16-pp bulletin. Temperature and pressure curves are included, along with dimensional data and diagrams. Amercoat Corp.

379 **Lined Clay Pipe**—Described in this illustrated brochure is a glass lined sewer pipe with built-in advantages. Performance and installation details are illustrated. American Vitrified Products Co.

381 **Flexible Metal Hose**—Featured in 8-pp Catalog 188 is a line of flexible metal hose, as well as rubber and synthetic hose, expansion joints and compensators. Detailed specifications and dimensional data are included. Flexonics Corp.

INSULATION

383 **Insulation Coating**—This 32-pp illustrated handbook, Form L-17, presents the advantages of company's No-Drip insulation coating for preventing condensation drip from metal, concrete, brick, wood, plaster, or composition surfaces. Lists applications. Mortell Co.

384 **Pipe Insulation**—Properties and advantages of fiber glass pipe insulation are detailed in Bulletin F-100. Tables list dimensional and packaging data, and specifications given. Pittsburgh Plate Glass Co.

385 **Piping Insulation**—Seven-pp Bulletin SO 1054 features a snap-on, one-piece molded pipe insulation of fine-glass fibers for hot or cold piping. Specifications are included. Gustin-Bacon Mfg. Co.

386 **Insulation Specifications**—This set of six specifications covers applications of Foamglas insulation for industrial equipment and piping. Each booklet contains tables of suggested thickness of insulation to be applied, drawings of installation procedure, supports, and recommended finishes. Booklets are devoted to low-, medium-, high-, and dual-temperature equipment and piping, to underground piping, and spheres. Pittsburgh Corning Corp.

LUBRICANTS, LUBRICATION

387 **Organized Lubrication** — Benefits of organized lubrication—major cost control factor are extolled in this 24-pp bulletin. Cost control opportunities are detailed and the task of assigning responsibilities and delegating authority in an organized lubrica-

RAIL and TRACK ACCESSORIES

Get the advantage of "single-source" buying for all your needs in industrial track and crane runways. Prompt deliveries assured from the nation's largest warehouse stocks of rail, switch material, tools and construction products. Foster is national distributor to industry for major manufacturers, such as Weir-Kilby, Woodings-Verona, Nolan, Western Industries and others.

Refer to our catalogs in Sweet's File

L. B. FOSTER CO.
PITTSBURGH 30 NEW YORK 7 CHICAGO 4
HOUSTON 2 LOS ANGELES 5 ATLANTA 8

For more facts circle 636 on Reply Card

FREE Quick Reference CATALOG F-10R

OPW KAMLOK for hose and pipe
QUICK COUPLING ASSEMBLIES

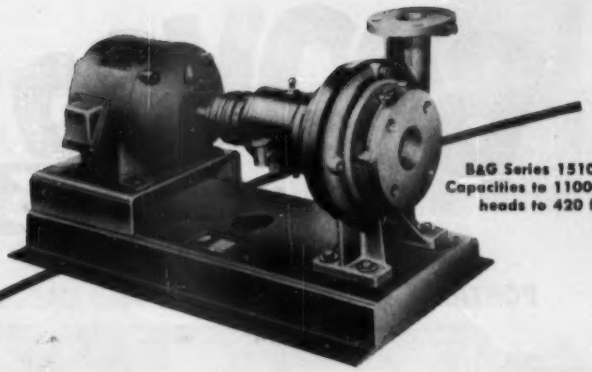
Lots of illustrations clearly show the complete interchangeability of master gauged Kamloks. Detailed recommendations and sizing charts, typical specials for unique installations and factual information will help you in planning, selection and determining installati n.

Just write us on your letterhead.

OPW-JORDAN
OPW-JORDAN CORPORATION
6013 Wiehe Road, Cincinnati 13, Ohio

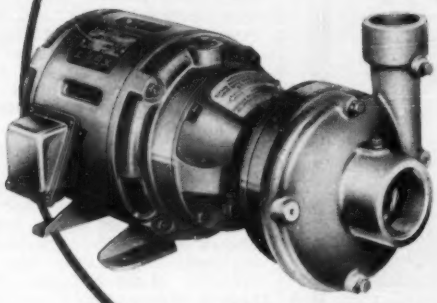
For more facts circle 637 on Reply Card

A GREAT LINE OF PUMPS ALL EQUIPPED WITH THE...



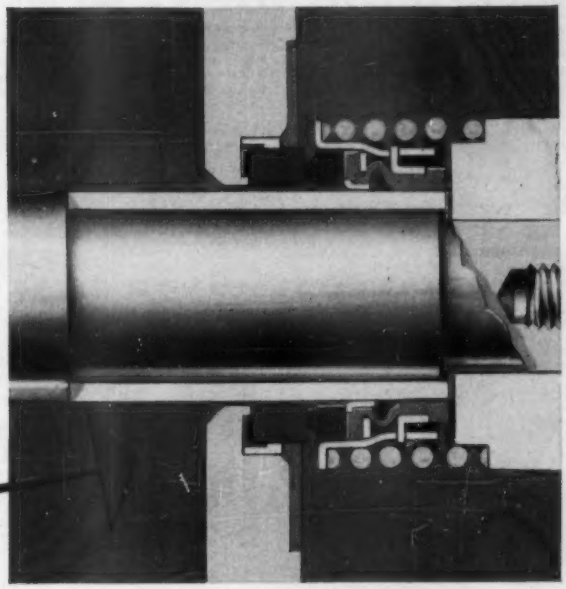
B&G Series 1510-B. Capacities to 1100 GPM, heads to 420 ft.

B&G Series 1531-B. Capacities to 1500 GPM, heads to 420 ft.



B&G Series 1522. Capacities to 150 GPM, heads to 115 ft.

B&G "Remite"®
MECHANICAL SEAL
...an exclusive feature for leakproof operation



Take just a moment to examine the design features of B&G Centrifugal Pumps. You'll find plenty of reasons why these pumps are giving trouble-proof performance through long years of service.

Vertical split-case construction permits removal of the bearing bracket without disconnecting pipe lines or motor leads. Solid cast iron volutes, with support feet in larger units, effectively prevent piping strain on the motor.

The shafts of B&G Centrifugal Pumps are an outstanding feature. Made of special alloy steel, they are super-finished and oversized to keep deflection at a minimum. The "Remite" Mechanical Seal—a B&G development—positively prevents leakage...and impellers are soundly designed to maintain hydraulic balance. An oil lubrication system, instead of grease cups, assures continuous protection to the long bronze bearings.

Exclusive "Remite" Mechanical Seal

This B&G feature eliminates the customary leakage which occurs where a packing gland is used. A Carbon Seal Ring faces on a "Remite" floating seat—*a new type of material, so hard it will scratch glass—wear-proof and corrosion-resistant.* Metal parts are of steel, bronze or stainless steel, depending upon the type of service. The B&G Mechanical Seal is self-lubricating.

B&G Centrifugal Pumps are available as all-iron, bronze-fitted, all-bronze and stainless steel units and in capacities to cover a wide range of industrial applications.

IMMEDIATE DELIVERY
ON PUMPS IN FACTORY STOCK
Available in commonly used sizes—capacities to 320 GPM, heads to 140 ft. Send for catalog CSP-359.

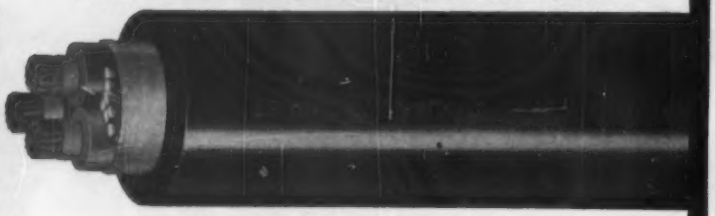
BELL & GOSSETT
COMPANY
Dept. FZ-53, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ont.

For more facts circle 638 on Reply Card

BRONCO Certified 66 NEOPRENE

PORTABLE ELECTRICAL CORD AND CABLE



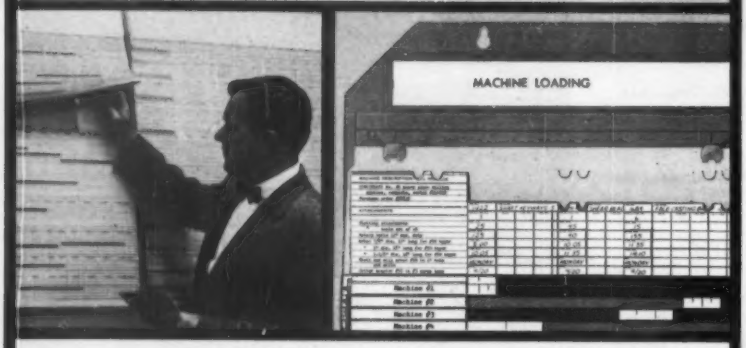
has the HIGHEST NEOPRENE content in the industry!

67.32% Neoprene in the outer protecting jacket gives your Bronco 66 Certified cables maximum protection against oil and grease, ozone, flame, heat, abrasion, chemicals. Neoprene content, with other identifying data, is permanently molded into the jacket by Bronco's patented (U.S. #2867001) branding process. Write for catalog.

WESTERN INSULATED WIRE CO., LOS ANGELES 58, CALIF.

For more facts circle 639 on Reply Card

NEW LOW-COST WAY TO RAISE OUTPUT



Acme Visible Planning Panels make it easy to stay on top of your shop

Timing is the essence of high production at low cost. And Acme Visible Panels make it easy for you graphically to plan, schedule and follow through every job. Machine loading. Personnel assignment. Shipping. Data cards in pockets keep essential facts at your fingertips. Visible margins portray your scheduling and work progress at a glance. Send for full facts.

ACME VISIBLE

Acme Visible Records, Inc.,
3612 West Allview Drive, Crozet, Va.

Please send free booklet on production planning and control panels.

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ STATE_____

For more facts circle 640 on Reply Card

DATA FILE

(Begins on page 220)

tion system discussed. Method of determining savings and setting up records to measure results covered. Texaco, Inc.

388 **Lubricant Data** — Characteristics, advantages of company's line of specialized fluid and grease type lubricants are described in 32-pp Data Book 59-1. Includes sections on control of friction, use of grease type lubricants, proper applications, and recommendations for various operating conditions. Lubriplate Div., Fiske Brothers Refining Co.

389 **Product Guide**—This handy little booklet gives information on manufacturer's line of industrial products—general lubricants, greases, diesel lubricating oils, metalworking oils, hydraulic oils, heat-transfer oils, waxes, petro-chemicals, spray oils, solvents, others. Sun Oil Co.

MATERIALS HANDLING

391 **Electric Hoists** — Twelve-pp Bulletin DH 133D describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data included. Wright Hoist Div., American Chain & Cable Co., Inc.

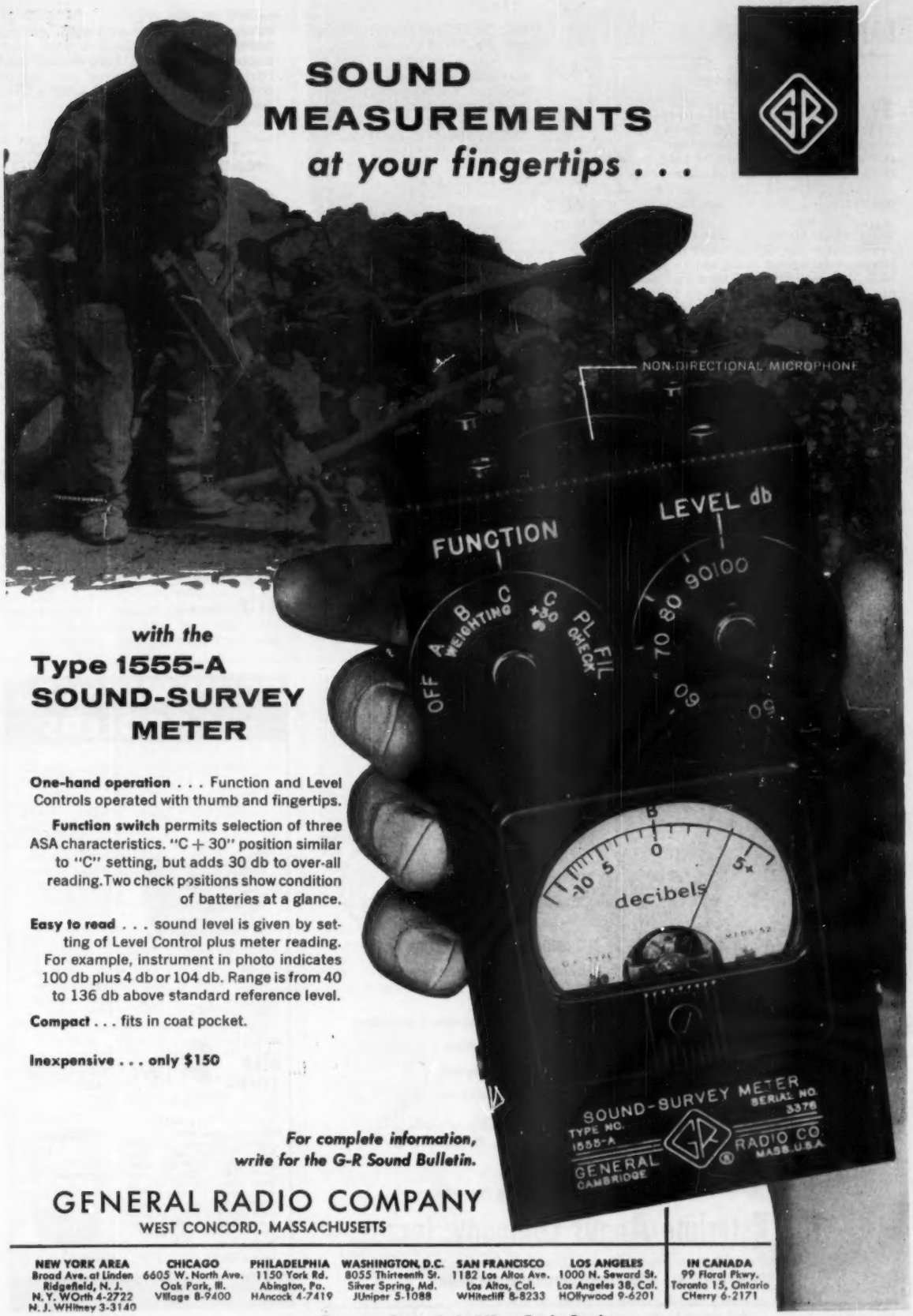
392 **Electric Hoists**—Six-pp illustrated Bulletin 905 describes R&M Type J electric wire rope hoists in capacities of ¼, ½, 1 and 2 tons. Shows complete specifications incuding mounting options and sectional drawing. Hoist & Crane Div., Robbins & Myers, Inc.

393 **Sheet and Coil-Lifters**—Bulletin SL-30, 16-pp, illustrates and describes various types of standard and semi-special lifters for one-man or automatic handling of sheet and coil stock. Advantages and design features are detailed and dimensions included. Cullen-Friestedt Co.

394 **Automatic Bulk Handling** — Bulletin 531, 12-pp, on new techniques for automatic bulk, handling describes pneumatic conveying methods in integrated manufacture. Describes two polyethylene handling installations to show how a system approach to air conveying solves complex handling problems. Dracco Div., Fuller Co.

395 **On Spiral Conveyors**—Described in 60-pp Catalog 951 are spiral conveyors and fittings for meeting practically any requirement and operating condition. Four principal types—helicoid, sectional flight, ribbon flight, and cast iron—are listed along with special types. Selection tables list materials which can be effectively handled in a spiral conveyor, giving weights, loading classifications, characteristics and horsepower factors. The Jeffrey Mfg. Co.

SOUND MEASUREMENTS *at your fingertips . . .*



with the

Type 1555-A SOUND-SURVEY METER

One-hand operation . . . Function and Level Controls operated with thumb and fingertips.

Function switch permits selection of three ASA characteristics. "C + 30" position similar to "C" setting, but adds 30 db to over-all reading. Two check positions show condition of batteries at a glance.

Easy to read . . . sound level is given by setting of Level Control plus meter reading. For example, instrument in photo indicates 100 db plus 4 db or 104 db. Range is from 40 to 136 db above standard reference level.

Compact . . . fits in coat pocket.

Inexpensive . . . only $150

For complete information, write for the G-R Sound Bulletin.

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS

NEW YORK AREA	CHICAGO	PHILADELPHIA	WASHINGTON, D.C.	SAN FRANCISCO	LOS ANGELES	IN CANADA
Broad Ave. at Linden Ridgefield, N. J. N. Y. WOrth 4-2722 N. J. WHitney 3-3140	6605 W. North Ave. Oak Park, Ill. Village 8-9400	1150 York Rd. Abington, Pa. HAncock 4-7419	8055 Thirteenth St. Silver Spring, Md. JUniper 5-1088	1182 Los Altos Ave. Los Altos, Cal. WHitecliff 8-8233	1000 N. Seward St. Los Angeles 38, Cal. HOllywood 9-6201	99 Floral Pkwy. Toronto 15, Ontario CHerry 6-2171

For more facts circle 641 on Reply Card

DATA FILE

(Begins on page 220)

396 Self-Dumping Hopper—Described in Bulletin 260 is a self-dumping hopper for low-cost handling of wet or dry, hot or cold, bulk materials. A variety of standard models are pictured and described in detail. Roura Iron Works, Inc.

397 For Dumping 'Most Anything—Features and advantages of multi-purpose dumpers, designed to handle bulk, bags, drums, barrels, boxes etc., are detailed in this 8-pp bulletin. Typical applications are illustrated, specifications and dimensions included. Essex Conveyors, Inc.

398 Casters and Wheels—Featured in 40-pp Catalog DP-104 is company's complete line of casters and wheels, including a heavy duty and a pneumatic series. Included is an index designed to simplfy the checking of caster and wheel specifications for any particular application, covering duty classifications, product series, capacities. Rapids-Standard Co., Inc.

399 Industrial Casters—Catalog 159 contains 24-pp of illustrations, descriptions and specification data on swivel-plate and rigid-plate truck casters for industrial applications. Includes detailed information on spring-action casters, V-grooved casters, grease-sealed casters, scaffold casters, floor truck locks, industrial wheels, and others. Faultless Caster Corp.

400 Material Handling—Sixteen-pp Catalog 90 covers a diversified line of corrugated steel boxes, skids and pallets for unit load handling. Design and application ideas to help speed production and solve specific handling problems are presented. The Union Metal Mfg. Co.

401 Vertical Transportation—Selection of vertical transportation for every traffic-moving job is detailed in 32-pp Bulletin A-382. Various types of elevators and escalators for a variety of commercial and industrial applications are described and illustrated. Otis Elevator Co.

SLINGS, CHAINS, WIRE ROPE AND FITTINGS

402 Wire Rope Manual—"Inspection of Wire Rope," "Methods of Lubricating Wire Rope," "Use and Abuse of Wire Rope," and "Sheave Maintenance" are among subjects covered in this 188-pp Wire Rope Manual, Catalog G-16. In addition, there are sections devoted to strengths and weights of wire rope, cable assemblies, and rated capacity of slings. Manual is available to qualified plant engineers. Macwhyte Co.

403 Aluminum Coated Wires—Described in 6-pp Folder DH-537B are aluminized steel wire and wire products, including steel core wires, steel strand guy wire, overhead ground wire, toe wire, messenger wire, telephone wire, chain link fabric and barber wire. Properties and applications listed. Page Steel & Wire Div., American Chain & Cable Co., Inc.

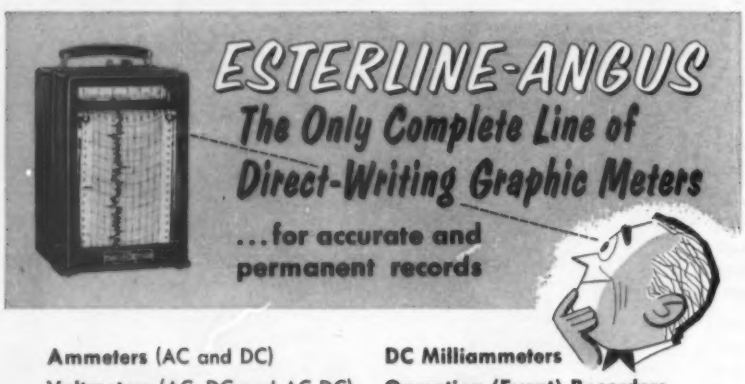
TOOLS, WELDING, AND MACHINE SHOP EQUIPMENT

404 Pipe Tools—Ordering and application information on Rigid pipe tools is provided in 16-pp illustrated Catalog 7596R-6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives. The Ridge Tool Co.

405 Stud Drivers—Details on company's line of stud drivers and accessories designed for anchoring in steel and concrete are presented in this 10-pp bulletin. Various type studs are illustrated, as well as accessory equipment. Remington Arms Co., Inc.

406 Welding Flux Recovery—This bulletin tells how company's equipment salvages unused flux from submerged arc welding, removes powder and returns slag-free, dust-free flux to welder in a continuous flow. Dimensions and specifications are given for extensive line of stationary, portable models. Invincible Vacuum Cleaner Mfg. Co.

407 Machine Mounts—A vinyl cork, sisal machine pad and an adjustable machine mount for reduction of



Ammeters (AC and DC)
Voltmeters (AC, DC and AC-DC)
Wattmeters (AC, DC and AC-DC)
KVA and KVAR Recorders
Power Factor Recorders
Frequency Recorders
Contact-Making Instruments
DC Milliammeters
Operation (Event) Recorders
Speed Recorders
Pressure and Vacuum Recorders
Position and Motion Recorders
Rectifier Type Meters
—for AC-DC Amperes, Volts

... with the largest selection of Chart Drives: *Hand-Wound Spring; Motor-Wound Spring; Synchronous Motor; Selsyn; Phantom;* and *High Chart Speed Attachments.*

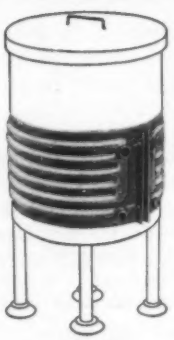
For further information, send for Catalog No. 657

The Esterline-Angus Company, Inc.

More than 50 Years Manufacturing Graphic Instruments
Dept. J, P. O. Box 596, INDIANAPOLIS 6, INDIANA

For more facts circle 642 on Reply Card

DRUM WARMERS and COOLERS



In previous issues you have seen the Drum Warmer shown small, below. The Clamp-On Type at the left is similar — but on legs. The Dean PANEL-COIL warms and cools ALL designs and sizes. No electrical spark or flame hazards. Safe. Simple. Economical.

DEAN THERMO PANELCOIL
PATENTED & PATENTS PENDING

TAKES THE PLACE of old-style pipe coils for ALL services. Superior in every way. Usually costs less. Weighs less. Uses less space. Form DW-6 tells all about Dean Drum Warmers & Coolers. What is YOUR heat transfer problem? Get complete data and prices on latest Dean models which assure INCREASED CAPACITY. Write, wire or phone.

Backed by 24 Years of Panel Coil Manufacturing

DEAN PRODUCTS, INC. 622 Franklin Ave
BROOKLYN 38, N. Y. Tel. STerling 9-5400

For more facts circle 643 on Reply Card

transmitted vibration and no bolting of machine are described in literature available from the company. Clark-Cutler-McDermott Co.

408 Vibration Control—Bulletin 59-05 contains shock and vibration control data. Various types of isolation mounts for machinery, commercial applications, and test equipment are listed. Barry Controls, Inc.

409 Data for the Shop—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44-pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. Coversion tables, steel numbering systems, machinability ratings. Standard Oil Co. (Ind.)

HEATERS, HEATING

411 Heating, Ventilating Units—Advantages of design and performance of these heating and ventilating units are described in 36-pp Catalog 858. Detailed selection data and performance tables are included, as well as arrangement diagrams, dimensions, control suggestions, piping diagrams and weights. Modine Mfg. Co.

412 Direct Fired Heaters—Complete description and specifications on unit heaters, duct furnaces and heavy duty heaters are presented in 12-pp Bulletin A1-1.2b. Cutaway views and construction features are included. Reznor Mfg. Co.

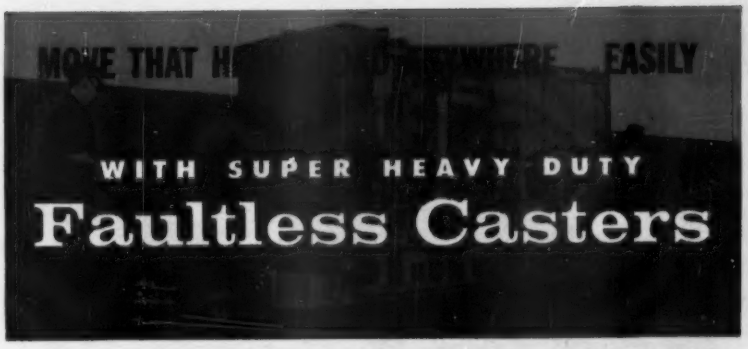
413 Unit Heaters—Eight-pp Bulletin UH858 contains detailed information on company's line of gas-fired unit heaters for a variety of applications. Design and installation data is given, as well as performance results, dimensions. Grinnell Co., Inc.

414 Heating and Ventilating—Company's "comfort curtain" principle of heating and ventilating is described in this 8-pp bulletin. Advantages are detailed and typical installations pictured through drawings and photos. Lennox Industries Inc.

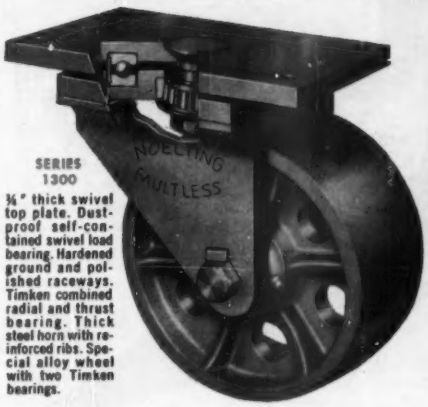
415 Unit Heaters—Performance and application information on company's line of unit heaters for steam and hot water heating systems is presented in 16-pp Catalog 159. Steam and hot water performance data tables are included, as well as dimensional data, mounting suggestions, points on selecting and locating unit heaters. Modine Mfg. Co.

416 For Heating Radiation Water—Detailed information on an instantaneous type heat exchanger designed to heat liquid with steam and having widest application in heating radiation water is presented in 32-pp Bulletin SC 159. Tables of dimensions and ratings furnish complete data for selection. Bell & Gossett Co.

417 Electric Process Heaters—Catalog 60, 64-pp. illustrates complete line of Chromalox electric process



Dreadnaught Casters move loads up to



SERIES 1300

¾" thick swivel top plate. Dust-proof self-contained swivel load bearing. Hardened ground and polished raceways. Timken combined radial and thrust bearing. Thick steel horn with reinforced ribs. Special alloy wheel with two Timken bearings.

7½ Tons

PER CASTER

When it comes to *CASTER STRENGTH* for rolling the big loads along your assembly line, or around your stock pile area, Faultless engineered casters can give a lift to your big production and warehousing problems. Above, a Faultless Series 1300 Swivel Plate Caster and two Faultless wheels in special mountings easily handle a 22,000 lb. Caterpillar Diesel-electric engine with minimum manpower; a usual task for the Faultless Series 1300 Dreadnaught Caster.

Super strong HX300 Casters handle loads up to

5 Tons

PER CASTER WITH 8" WHEEL

For surplus strength to roll under cargoes that break down or damage ordinary casters, the HX300 Series, extra heavy duty swivel caster, will fit your specifications. It's precisely engineered throughout and constructed of quality materials to provide a caster capable of easily taking on 10,000 lb. loads, while keeping production lines moving with minimum handling costs.

SERIES HX-300

1" dia. king pin. Thick steel top plate. Self-contained main load bearing has dust guard and grease seal. Timken radial and thrust bearing. 8" or 10" semi-steel wheels with Timken bearings.

ASK YOUR DISTRIBUTOR: Your nearby Faultless Industrial Distributor maintains a substantial inventory of Faultless Casters for immediate delivery. He and one of the strategically located Faultless Sales Engineers are available to work with you on every handling problem in your plant. Both are listed in the phone book Yellow Pages, under "Casters," and the Faultless heading.

INDUSTRIAL DISTRIBUTORS — THE RIGHT HAND OF PRODUCTION

Faultless Caster Corporation

Evansville 7, Indiana

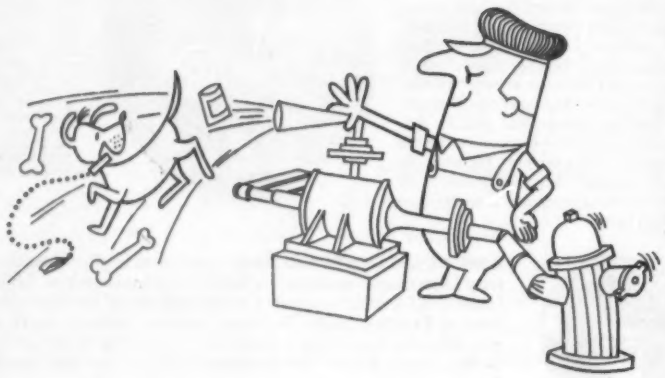
Representatives in Atlanta, Baltimore, Boston, Buffalo, Chicago, Cleveland, Dallas, Detroit, Grand Rapids, Greenville, S.C., High Point, Indianapolis, Los Angeles, New Orleans, New York, Philadelphia, Portland, St. Louis, Washington, D.C., Canada: Stratford, Ontario.

NOELTING Faultless Casters

For more facts circle 644 on Reply Card

Office . . . Plant . . . Factory . . . Instant Communication
WITH THE CITIZENS BROADCASTER CB-100
$129.95
low cost, smartly styled, practical and sturdy 2-way 3-channel Radio Station complete*
NO OPERATOR'S LICENSE REQUIRED
FCC FORM 505 FOR STATION LICENSE SUPPLIED . . . NO TESTS, NO EXAMINATIONS

* WITH MICROPHONE AND CRYSTALS FOR ONE CHANNEL
Write for Brochure & Name of Local Dealer
GLOBE electronics
A DIVISION OF TEXTRON ELECTRONICS, INC.
3412 W. BROADWAY, COUNCIL BLUFFS, IOWA
For more facts circle 645 on Reply Card

WEMCO® the INCREDIBLE Torque-Flow Pump
pumps almost everything
(what will go in will come out)

secret: recessed impeller; continuous open passage
(chances are it will work profitably for you)
Western Machinery Company 650 Fifth Street • San Francisco, Calif.
For more Facts circle 646 on Reply Card

DATA FILE

(Begins on page 220)

heaters and discusses their many uses. Presents some 15,000 types of heaters to fit most applications. Includes a comprehensive application section and a technical section to aid in accurate calculation of heating requirements. Each product is illustrated and described with lists of types, sizes and ratings. Edwin L. Wiegand Co.

418 **Thermo-Panel Coil**—Technical Data Bulletin 355 is a 48-pp guide to company's panel coil for heating and cooling applications. Features of materials and design are illustrated and described, and detailed specification and dimension tables, heat transfer coefficient charts, capacity tables, other data are included. Dean Thermo-Panel Coil Div.

SAFETY, SANITATION

419 **Insect Control**—Featuring manufacturer's insecticides and insect control equipment, this practical 36-pp booklet provides excellent tips on the control of industrial insects. More than 60 pests are pictured along with specific information on where they are found, identifying features, extent of damage, life stages and cycles, characteristics of existence. West Chemical Products, Inc.

420 **Industrial Soaps**—Featured in this product bulletin are three skin cleaners designed for use in industrial plants. A fine granulated cleanser, a heavy duty type, and an extra fine granulated cleanser are covered. Sugar Beet Products Co.

421 **Engineered Maintenance**—This 16-pp booklet tells how to control costs, improve efficiency and save management time in sanitary maintenance. Tells what an engineered maintenance program includes, how it is prepared, advantages afforded. Puritan Chemical Co.

FANS, VENTILATING, AND AIR CONDITIONING

423 **Induced Draft Fans**—Catalog L-3 describes induced draft fans designed for any induced draft application for temperatures up to 800 F. Gives dimensions, capacities, as well as installation data. Fuller Co.

424 **Standard Duty Fans**—Designs and construction details of company's line of standard duty fans are covered in 28-pp Bulletin 572. Points out advantages, shows arrangement and application, describes accessories. The New York Blower Co.

425 **Industrial Fans**—Bulletin 690-A, 12 pp, contains dimensions and application and perfomance data on direct connected fans for general and system ventilation and power roof ventilators, with air deliveries to 103,200 cfm. Design features and typical installations illustrated. Propellair Div., Robbins & Myers, Inc.

426 **Mechanical Draft Fans**—Eight-pp Catalog 1361 describes centrifugal fans designed for handling abrasive gases at elevated temperatures. Complete application, performance and physical data are given, as well as a list of optional accessories. Sturtevant Div., Westinghouse Electric Corp.

427 **Air Engineering**—Bulletin E-57 is a 24-pp air engineering data file covering engineering and test facilities for propeller fans, specifications, construction, maintenance, and installation. Tables for estimating air-handling requirements are provided. Aerovent Fan Co., Inc.

428 **Air-Moving Equipment**—Bulletin DB 45-58, 20-pp, contains detailed information on company's line of roof ventilators, bifurcators, axial flow vent sets, and air jets. Bonded performance ratings are listed on tables, and dimensional data included. De-Bothezat Fans Div., American Machine and Metals, Inc.

429 **Ready Units**—Catalog 517 provides 36-pp on complete, ready-to-run centrifugal fan equipment. Capacities 400 to 13,000 cfm, belt and direct driven units. Dimensions included. Clarage Fan Co.

430 **For Air Purification**—Twelve-pp Bulletin 108 A describes and illustrates Dorex activated carbon air purification equipment—C cells and H cannisters. Data on equipment selection, installation and application is given, also information on Dorex replacement service. Discussions of activated carbon and how to achieve conditions generally necessary for proper purification are included. Connor Engineering Corp.

431 **Power Exhausters**—Bulletin 58-B contains 12-pp of detailed information on company's line of power exhausters. Construction features are illustrated and described, and performance and dimensional tables are included. Cutaway views and drawings show internal construction features. Jenn-Air Products Co., Inc.

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 215 and 216.

432 **Zone Control Cabinets**—Air conditioning zone control cabinets are described and illustrated in 20-pp Bulletin AC-220. Separate sections with tables, curves and sketches cover proper unit selection, physical data, dimensions, fan performance and coil ratings for water cooling, direct expansion, hot water and steam. Buffalo Forge Co.

433 **Air Conditioning Units**—Bulletin 786 contains 54 pp of selection data on air conditioners, including capacities, standard arrangements, dimensions, etc. Steps in selection of basic unit and components are outlined. First pages are devoted to choosing the physical size based on air capacity and face velocity requirements, while succeeding pages concern themselves with heating and cooling requirements, control. American Air Filter Co., Inc.

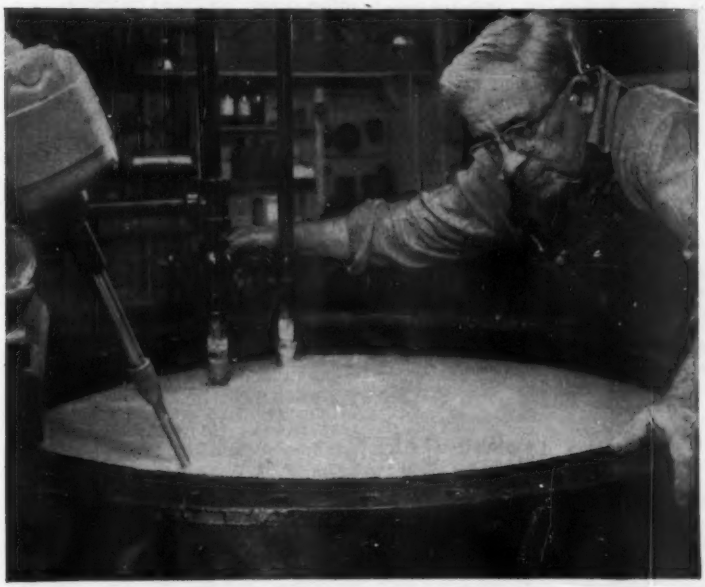
434 **Air Conditioning Systems**—Summer and winter air conditioning systems for year-round comfort are illustrated and described in 24-pp Form L-115. Covers waterless conditioners, gas and oil winter air conditioners, and individual room conditioners and other equipment. Capacity data, dimensions and specifications. Airtemp Div., Chrysler Corp.

BOILERS AND GENERATORS

436 **Hot Water Boilers**—Catalog HCC-2, 20-pp, describes and illustrates design, construction, advantages and economics of company's controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process applications. Combustion Engineering, Inc.

437 **Boiler Construction**—Bulletin BE100 describes advantages of practical boiler construction with 2 pass design, featuring comparable results with equal heating surface, but with Continental's two-pass features—turbulent spinning gas technique-uniform heating, no refractory baffles

HAGAN COAGULANT AIDS SOLVE COLOR PROBLEM FOR WOOLEN MILL



Slurry-Feeding Hagan Coagulant Aid No. 18 at J. J. O'Donnell Woolens, Inc.

J. J. O'Donnell Woolens, Inc. produce cashmere and high quality ladies woolen goods, specializing in pastel shades. Located downstream of a steel mill, a sewage plant and several other woolen mills, the periodic high organic color and detergent content of Blackstone River water created a difficult clarification problem. Even with heavily increased alum dosages, color removal was poor, frequently necessitating reprocessing.

Over two years ago, the plant adopted the use of Hagan Coagulant Aid No. 18 during periods of high color. Alum dosage has been reduced by 25%, with good floc formation and sedimentation. Color removal is now excellent.

Hagan Coagulant Aids are non-toxic, easy to handle, and produce a large tough floc that speeds settling time and reduces carryover.

Hagan Aids may be dry-fed or slurry fed as desired. Write for Bulletin 410-12-2 for information on the complete line of Hagan Coagulant Aids.

CALGON COMPANY
DIVISION OF HAGAN CHEMICALS & CONTROLS, INC.
HAGAN BUILDING, PITTSBURGH 30, PA.
In Canada: Hagan Corporation (Canada) Limited, Toronto

For more facts circle 647 on Reply Card

How to cut scrap handling costs 50%

Here's the fastest, lowest cost method of scrap handling ever devised. Hundreds of industries are now using Roura Hoppers instead of barrels or tote boxes to collect scrap metal. They're placed alongside machines or in strategic locations. When full, lift truck operator picks up loaded hopper . . . transports it to scrap bin or freight car . . . flips the latch . . . and the hopper automatically dumps its load, rights itself, locks itself. Hopper is returned to its station and operator is free for other work.

Segregation of scrap is simple. Hoppers can be marked for copper, brass, stainless, etc. Brings higher prices.

Roura Hoppers are made in five sizes, ½ to 2 yard capacities. Sturdily built of ⅛" steel plate with continuous arc-welded seams. Also available in stainless steel or galvanized. Mounted on live skids or a choice of wheels. Standard models available for immediate shipment from stock.

Start cutting costs now . . . with Roura Hoppers. *Remember . . . if it's as good as a Roura it IS a Roura.*

ROURA
Self-Dumping
HOPPER

HERE'S HOW to get more details about Roura Self-Dumping Hoppers. Just attach this coupon to your letterhead . . . sign your name . . . and mail to . . .

ROURA IRON WORKS, INC.
1413 Woodland Ave., Detroit 11, Michigan

For more facts circle 648 on Reply Card

DATA FILE

(Begins on page 220)

and symmetry of furnace layout. Boiler Engineering & Supply Co.

MAINTENANCE

438 Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses roofing practices. Johns-Manville.

439 Zinc Coating—This bulletin describes a special zinc coating applied as a paint to provide galvanic protection to metals. A variety of applications are detailed. Subox, Inc.

440 Colored Aluminum Paint—Long-lasting beauty afforded by colored aluminum paint in addition to regular protection benefits of aluminum is stressed in this illustrated bulletin. Touches briefly on types of coatings available and pictures some equipment and structural uses of the paint. Reynolds Metals Co.

441 Cements For Maintenance Repair—Described in this product bulletin is a line of cements for a variety of industrial repair applications. Covers expanding iron cements, epoxy resin metallic cements, and epoxy resin industrial maintenance kits. Smooth-On Mfg. Co.

442 Industrial Vacuum Cleaning—Twelve-pp Bulletin 155 B describes both stationery vacuum cleaning equipment and portable industrial vacuum cleaners, the latter in both light and heavy-duty types. The Spencer Turbine Co.

443 For Overhead Maintenance—Bulletin G205RR, 8-pp, tells how to control costs when maintenance goes above arm's reach—for painting and cleaning, electrical work, etc. Pictures a variety of scaffolding arrangements. Provides brief product information on steel and aluminum scaffolding, ladders. The Patent Scaffolding Co., Inc.

OTHER EQUIPMENT

444 Fire-Resistant Fluids—This series of specification sheets describes company's line of fire-resistant fluids, including synthetic, oil-water emulsion, and glycol types. Physical characteristics and other data on each included. Socony Mobil Oil Co., Inc.

445 Preheating Combustion Air—This well-illustrated 36-pp booklet explains fuel savings and increased performance made possible by using waste heat in flue gases to preheat incoming combustion air. Also covers increased boiler output, ability to use lower grade fuels effectively. Air Preheater Corp.

446 Product Directory—This Product Directory G-103 provides a basic source of information on company's divisions and products. Products are divided into major subgroups—chain link fence, chemicals and coke, springs, belts, wire, wire cloth, etc. The Colorado Fuel and Iron Corp.

447 Industrial Finishing Equipment—Catalog A659, 12-pp, describes modern finishing system for cleaning, rust proofing, drying, painting and finish baking. The R. C. Mahon Co.

448 To Combat Abrasive Wear—What abrasive wear is, its economic significance, and how to combat it with molybdenum-containing materials are described in this 36-pp bulletin. Describes three general types of abrasive wear—gouging, grinding, and scratching. Selection of material for particular types and conditions is covered. Climax Molybdenum Co.

449 Industrial Cooling Towers—Design and construction features of company's industrial cooling towers utilizing the cross-flow principle are detailed in Bulletin G-60. Also described are double-flow aquatowers, and other equipment. The Marley Co.

450 Wrought Iron Tubing—This 10-pp booklet on heat exchangers and condenser tubes cites installations in which use of cold drawn wrought iron and other metal tubing in the same equipment permits service life comparisons. Listed are cost-per-foot-per-year figures for each material and the corrosive conditions to which tubing was subjected. A. M. Byers Co.

451 Steel and Aluminum Data—This new 256-pp edition of company's Data Book includes aluminum analyses, characteristics, mechanical properties and tolerances, in addition to information on steel such as machining and fabricating data, manufacturing practices and tolerances, weights, safe loads, ASTM standards, compositions and properties, and miscellaneous facts of practical value. Book is available to qualified plant engineers. Please state your job title when requesting it. Joseph T. Ryerson & Son, Inc.

452 Steam Atomization—Bulletin 1252 contains detailed information on a steam-atomizing burner system designed for burning low-cost heavy oils. Advantages are explained and operation illustrated and described. Orr & Sembower, Inc.

453 Chain Link Fencing—A comprehensive review of aluminum's role in the growing fence market today is presented in this 12-pp booklet. Outlines details of typical installations of aluminum chain link fence. Complete technical data on strength, resistance to corrosion, and durability is presented. Tensile strengths, as well as suggested aluminum alloys, are included. A companion publication gives suggested specifications. Aluminum Co. of America.

G-K
OVENS FOR INDUSTRY
• INDUSTRIAL FUME & DUST REMOVAL SYSTEMS
• WASHERS, OVENS, SPRAY BOOTHS
• INDUSTRIAL SHEET METAL FABRICATION
Batch-type recirculating gas fired oven

Designers, Builders and Installers of Ovens to handle any industrial process, and built to the exact specifications determined by our complete engineering analysis of your job requirements.

Write for our complete General Catalog

Gallagher-Kaiser CORPORATION

6195 Selkirk Ave., Detroit 11, Mich. • WAlnut 1-3088

For more facts circle 649 on Reply Card

One of a series

Engineer Shortage? — Who Says?

From time to time statements are issued and news stories are published on either the shortage or over-supply of engineers. Some of these stories can be startling. Too often they are based on insufficient information.

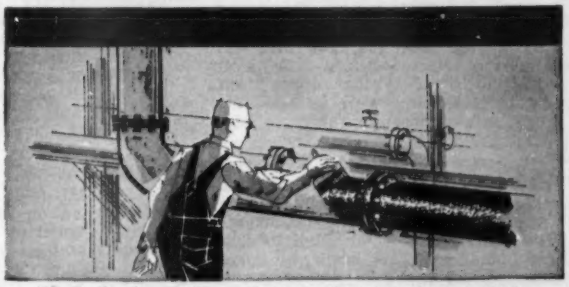
The Engineering Manpower Commission—a committee of Engineers Joint Council, representing 20 national engineering societies and 300,000 of the nation's engineers—always has the up-to-date facts. For figures, such as the number of engineers needed, freshman enrollments, number of graduates, current salaries—phone, wire or write—

ENGINEERS EJC JOINT COUNCIL

Engineers Joint Council
29 West 39th St., N. Y. 18, N. Y.
For information, call Pennsylvania 6-9220

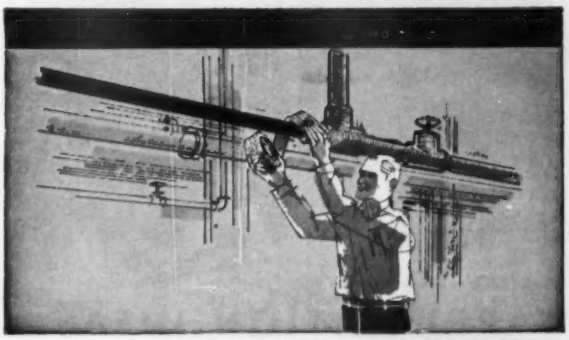
END ALL DRIP AND RUST PROBLEMS IN YOUR PLANT THESE TWO PROVEN WAYS!

Industrial plants know Mortell products offer more positive protection than any other drip-and-rust preventive. Maintenance men know that paints or compounds of paint and fish oil provide little or no permanent protection. Rust-inhibiting NoDrip Plastic Coating is a moisture-proof insulation that *does* stop condensation . . . forms a seamless jacket . . . *does* stop corrosion. NoDrip Tape, with its triple insulating barrier, is equally dependable.



For Tanks, Large Pipes, Air Ducts, Metal Equipment, Walls, Ceilings, Permanently End Condensation Drip, Rust and Corrosion With NoDRIP PLASTIC COATING

The heavy consistency of NoDrip outlasts many coats of paint or ordinary rust-preventives. Permanently insulates and protects. Applies easily with trowel, brush or special spray. Nontoxic, odorless and non-flammable. Resists acid, alkali, brine solutions or vapors. Available in 1, 5 and 55 gallon drums.



For Smaller Pipes or Tubing, Permanently End Condensation Drip, Rust and Corrosion With NoDRIP TAPE

An easy-to-use, wrap-around pipe covering, perfectly pliable, cork-filled, completely self-adhering. Forms an air-tight, 100% vapor- and moisture-proof jacket. Fits snugly even around tees, unions, angles, valves. Cuts maintenance costs—makes out-of-the-way storage areas useable—ends slip and slide floor hazards. No need for vapor seals, brads, fasteners or tools of any kind.

At all leading hardware, mill supply and plumbing jobbers. For complete information and technical handbook, write

Mortell COMPANY
897 Burch Street · Kankakee, Illinois

For more facts circle 651 on Reply Card

DATA FILE

(Begins on page 220)

454 Fighting Corrosion With Corrosion—Cathodic protection against rust and corrosion is the subject discussed in this illustrated 10-pp bulletin. Describes the corrosion battery, corrective measures. Electro Rust-Proofing Corp.

455 Fluid Mixers—Advantages and mechanical features of company's industrial mixers designed for a variety of fluid mixing operations are detailed in a series of bulletins available in this ring-bound notebook, containing Bulletins B-102, 103, 104, 108 and 111. Selection tables, outline dimensions and photos of typical applications are included, as well as specifications, mixer capacity tables, photos. Mixing Equipment Co., Inc.

456 Consulting Service — Advantages of company's consulting service are detailed in 8-pp Bulletin 5006-A. How the service is qualified to solve problems concerning scale and corrosion control in boilers, cooling systems, and process waters is discussed. Dearborn Chemical Co.

457 Laboratory Supplies—This 12-pp price list announces the latest prices for a wide range of laboratory supply items, including water analysis sets, conductivity equipment, colorimetric comparators, laboratory glassware and supplies, chemical reagents. Betz Laboratories, Inc.

458 Corrosion Data—Corrosion tests using typical chemicals at various temperatures form the basis of the ratings listed in this corrosion data chart. Data shows the resistance of company's Penton, a thermoplastic, to many typical chemicals at various temperatures. Hercules Powder Co.

459 Paint Finishing—Six articles on factors to consider when planning a paint finishing system are contained in this 24-pp reprint. They cover conveying systems, layout, equipment for metal preparation, ovens, methods of paint application, and auxiliary equipment. Many photos are included, also line drawings illustrating a typical layout and giving details of five stages of metal cleaning and preparation. J. O. Ross Engineering Div., Midland-Ross Corp.

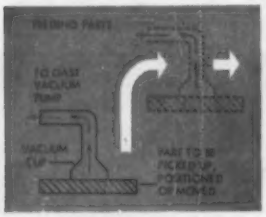
460 Electronics for Automation — Catalog HB-5901 provides 64-pp of information on home study training courses covering electronic fundamentals and electronics for automation. Summarizes lesson material covered and educational objectives. Shows how course presents such subjects as applications of industrial electron tubes, motors and motor controls, power supplies and regulation, sensing and control devices, servomechanism components, recording and readout devices etc. Includes details on handling of assignments and test papers, awarding of certificates, cost of tuition. RCA Institutes, Inc.

461 For Cleaner Furnace—The use and application of Oxi Crystals to keep furnaces and the fireside of boilers free of slag, encrusted carbon, soot and fire-scale is described in a recent pamphlet. Oxi Corp.

462 Coagulant Aids — Featured in this product bulletin is a line of coagulant aids designed to improve floc formation in clarifying and softening water. Advantages are detailed. Calgon Co., Div., Hagan Chemicals & Controls, Inc.

463 Air, Hydraulic Equipment Upkeep—"The ABC's on Maintenance of Air and Hydraulic Equipment," is a 24-pp cartoon-type booklet presenting the "rights" and "wrongs" in setting up and servicing air and hydraulic equipment. Major reasons for unsatisfactory performances and steps to prevent them outlined. Logansport Machine Co., Inc.

464 Guide to Shelving — To assist plant engineers in selecting proper shelving for all storage requirements, 64-pp Catalog 30 offers detailed suggestions for correct shelving and storing materials, loose and packed parts, record files. Shop equipment and storage cabinets are also described and instructions included for planning of stockrooms. Deluxe Metal Products Co. Royal Metal Mfg. Co.



NEW

Gast Booklet ready to give you

"APPLICATION IDEAS"

on uses of air motors, compressors, vacuum pumps

Looking for new ways to improve methods—save time—or cut costs? This booklet may be valuable to you! With line drawings, it shows dozens of the basic principles of "putting air to work".

With photographs of our customers' products—from air mixers to data plotters—it illustrates each principle...and shows how Gast rotary Air Motors, Compressors and Vacuum Pumps provide advantages as original equipment or in plant use.

Design Engineer or Plant Master Mechanic, you'll find this booklet of interest...and it may "spark" an important idea you can use!

WRITE TODAY FOR NEW "APPLICATION IDEAS" BOOKLET!

Gast Manufacturing Corp.
P. O. Box 117-U,
Benton Harbor, Mich.

GAST ROTARY
"Air may be your answer!"

- AIR MOTORS TO 7 H.P.
- COMPRESSORS TO 30 P.S.I.
- VACUUM PUMPS TO 28 IN.

For more facts circle 652 on Reply Card

AT STAUFFER

Corrosive wastes are handled in UPVC (unplasticized polyvinyl chloride) piping at the boric acid plant of Stauffer Chemical Company, San Francisco. Equipped with ttp drainage fittings.

To help you on UPVC piping

We have developed valuable data to help you design for UPVC piping to stop corrosion...available in ttp Catalog 119, free on request. Also gives complete specifications on ttp fittings, flanges, valves and specialties.

TUBE TURNS PLASTICS, INC.
DEPT. PE-12, 2929 MAGAZINE STREET
Louisville 11, Kentucky

For more facts circle 653 on Reply Card

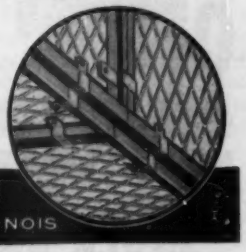
GLOBE SAFE·GARD EXPANDED METAL PARTITIONS with exclusive QUIK-ERECT patented fittings

(FORMERLY HILMAR)

...will answer all your enclosure problems

Here is the new, easier, simpler method of guarding conveyors and machines and for all in-plant partitioning. Shipped READY for erection, no cutting, drilling or welding required . . . these interchangeable expanded metal panels provide greater safety, cut overall costs, cover a wider range of use and require 85% less storage space.

EXCLUSIVE QUIK-ERECT SECTION CLIPS save much of the erection time formerly required. Proven successful in hundreds of installations, these Safe·*Gard* panels are of welded construction, give longer life, are more rigid and stronger than wire, will not ravel or fray.



Note enlarged detail showing SAFE·GARD Quik-Erect Clips securely joining the interchangeable panels.

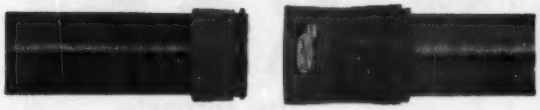
Write today for more details or call your Globe (Grip-Strut) Distributor.
Distributors in all principal cities, listed under "Grating" in your phone book.

114

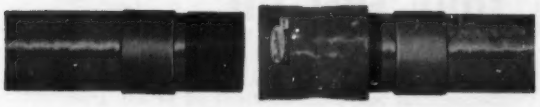
PRODUCTS DIVISION | THE GLOBE COMPANY
4016 SOUTH PRINCETON, CHICAGO 9, ILLINOIS

For more facts circle 654 on Reply Card

BONDSTRAND®



fiber-glass reinforced epoxy pipe by Amercoat®



... strong as steel pipe, only one-eighth the weight. Tensile: hoop 80,000 psi, longitudinal 40,000. Highly corrosion resistant. Won't scale, cold flow or deform. 20-foot lengths easy to cut and join; threaded or locking wedge fittings.

MOST COMMON DIAMETERS AVAILABLE

Write for BONDSTRAND technical brochure

Amercoat CORPORATION

Dept. LL • 4809 Firestone Boulevard
South Gate, California

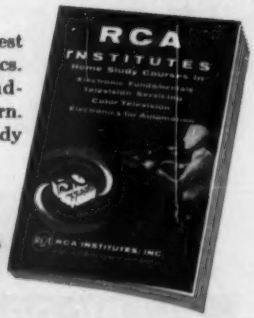
For more facts circle 655 on Reply Card

In your spare time...

LET RCA TRAIN YOU

IN ELECTRONICS FOR AUTOMATION

RCA Institutes offers you the finest of home study training in electronics. Courses for the beginner and advanced student. Pay-as-you-learn. You need pay for only one study group at a time.



WRITE FOR THIS FREE BOOK TODAY

RCA INSTITUTES, INC.
Home Study School, Dept. EN-129
A Service of Radio Corporation of America
350 West Fourth Street, New York 14, N. Y.

Another way RCA serves education through electronics

For more facts circle 656 on Reply Card

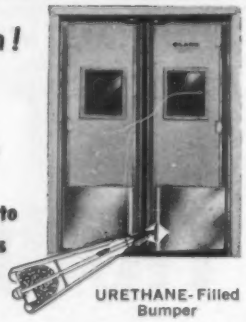
SHRUGS OFF SHOCKS that wreck ordinary doors

The Clark

SHOCK ABSORBER DOOR

rides with the punch!

Constant pounding by fork trucks won't faze the self-closing SHOCK ABSORBER DOOR. Made to withstand hundreds of thousands of openings, it can't rip, warp or come off the fastenings.



URETHANE-Filled Bumper

Like the trained Fighter, it rides with the blow, rather than resisting it. Full impact is absorbed by exclusive Urethane-Filled Bumpers. Flexible hinge arrangement distributes stress uniformly. Guaranteed Spring Return brings the Door back to tight, draft-free closure every time.

It will pay you to investigate the advantages of a Door that keeps traffic *moving*—without costly "time outs" for repair. Easily installed. No extras to buy. Stock sizes available for immediate shipment. Write for full information.

CLARK DOOR COMPANY, INC. *(since 1878)*
507 Hunterdon St.
Newark 8, N. J.

Manufacturers of famous PREST-O-MATIC®
Industrial and Cold Storage Doors.

For more facts circle 657 on Reply Card

MISTKOP

STOPS MIST

COLLECTS MIST-FOG EFFECTIVELY IN A SMALLER SPACE

This efficient Mistkop unit provides low-cost mist control for all machining operations employing coolants or lubricants. Requires no duct work or costly piping—*is actually portable!*

Mistkop is sturdy in design—has a minimum number of parts and gives long, trouble-free service. Stops clouding of lights . . . eliminates fire hazards of uncontrolled mist. Write for detailed description.

AGET Manufacturing Company
1388 Church Street • Adrian, Michigan

For more facts circle 658 on Reply Card

a few drops of

KOR

the miracle additive

WILL DO WONDERS FOR YOUR FUEL OIL

Regardless of what you burn: petroleum pitch or other residual oils, coal tar, diesel oil or any grade of fuel oil . . . KOR is your economical short cut to better combustion.

KOR . . . the perfect alkaline fuel oil conditioner . . . completely dissolves sludge, keeps it suspended in solution with the fuel.

KOR cuts fuel costs because it activates all the BTU's in the sludge and oil.

KOR keeps entire fuel systems clean, eliminates soot and carbon scale, minimizes cleaning.

Safe, Easy To Use, Economical *Ask for Literature*

KOR CORPORATION
712 BOX 485
GARY, INDIANA

For more facts circle 659 on Reply Card

ADVERTISERS IN THIS ISSUE

When writing to advertisers please tell them you saw their ad in Plant Engineering—or send us the number directly below ad—use the post card in "Bulletin Insert."

Acme Visible Records, Inc. 228
Adam Electric Co., Frank 63
Aget Manufacturing Co. 238
Air Preheater Corp. 41, 163
Alan Wood Steel Co. 169
Allen-Bradley Company 33-34
Aluminum Company of America 51, 191
Amerace Corporation
American Hard Rubber Div. 186
Amercoat Corporation 237
American Air Filter Co. 177
American Bridge Division
United States Steel Corp. 64-65
American Chain & Cable Co.
Wright Hoist Division 86
American Hoist & Derrick Co. 201
American Machine and Metals, Inc. 151
American Standard Industrial Div. 26-27
American Vitrified Products Co. 79
Armco Drainage & Metal Products 161
Armstrong Machine Works 43

Barber-Colman Company 210
Barnes & Jones, Inc. 174
Bell & Gossett Company 227
Betz Laboratories, Inc. 10-11
Boiler Engr. & Supply Co., Inc. 184
Buffalo Forge Company 76
Bulldog Electric Products Div.
ITE Circuit Breaker Co. 137, 139
Butler Manufacturing Co. 212
Byers Company, A. M. 67-68

Champion Lamp Works 60
Chemical & Power Products, Inc. 224
Chrysler Corporation
Airtemp Division 69
Clarage Fan Company 194
Clark-Cutler-McDermott Co. 190
Clark Door Company, Inc. 238
Climax Molybdenum Co. Back Cover
Colorado Fuel & Iron Corp. 240
Combustion Engineering, Inc. 183
Connor Engineering Corp. 192
Crane Company 157
Crouse-Hinds Company 39
Cullen-Friestedt, Inc. 240

Darling Valve & Mfg. Co. 48
Dean Products, Inc. 230
De Bothezat Fan Division
American Machine and Metals, Inc. 151
Douglas Fir Plywood Assn. 82
Duriron Company 143

Economy Engineering Co. 208
Edwards Company 213
Electro Rust-Proofing Corp. 204
Esso Standard Oil Co. 171
Esterline-Augus Co., Inc. 230

Falk Corporation 189
Faultless Caster Corp. 231
Federal Pacific Electric Co. 214
Fiske Bros. Refining Co. 30
Flexonics Corporation 35
Foster Company, L. B. 226

Gai-Tronics Corporation 176
Gallagher-Kaiser Corp. 235
Gardner-Denver Company 185
Garlock Packing Company 57
Gast Mfg. Corporation 236
General Cable Co. 153
General Electric Company
Apparatus Division 8-9, 47, 173, 193, 198-199
Circuit Protective Devices 159
Lamp Division 181
General Precision Laboratory, Inc. 210
General Radio Company 229
Globe Company
Products Division 237
Globe Electronics 232
Goodyear Tire & Rubber Co., Inc. 1
Green Fuel Economizer Co. 168
Grinnell Company 5

Hagan Chemicals & Controls, Inc. 233
Hercules Powder Co. 59

Ingersoll-Rand Company 46
Invincible Vacuum Cleaner Mfg. Co. 166
ITE Circuit Breaker Co. 72-73

Jeffrey Mfg. Company 179
Jenkins Bros. 219
Johns-Manville 36-37
Jordan Corporation 226
Joy Manufacturing Company 23

Kirk & Blum Mfg. Co. 200
KOR Corporation 238
Korfund Company 66

Lennox Industries, Inc. 208
Link-Belt Company 175
Liquidometer Corporation 154
Logansport Machine Co., Inc. 195
Louis-Allis Company 24-25
Lubriplate Division
Fiske Bros. Refining Co. 30

Mahon Company, The R. C. 141
Marley Company 58
Marsh Instrument Co.
Division of Colorado Oil & Gas Co. 240
Minneapolis-Honeywell 49, 152
Mixing Equipment Co., Inc. 188
Modine Mfg. Company 52-53
Mortell Company 235
Mueller Brass Company 44

Natco Corporation 3
New York Blower Co. 182

Otis Elevator Company 14-15

Page Fence Association 226
Pannier Corporation 62
Pass & Seymour 196
Phoenix Wire Works, Inc. 202
Pittsburgh Corning Corp. 209
Pittsburgh Plate Glass Co. 84-85
Plant Maintenance & Engr. Show 70-71
Puritan Chemical Company 20, 83

RCA Institutes, Inc. 237
Remington Arms Company, Inc. 61
Reynolds Metals Company 211
Reznor Manufacturing Co. 221
Ridge Tool Company 55
Robbins & Myers, Inc.
Industrial Motors 28-29
Rockwell Mfg. Company 74-75
Rohm & Haas Company 31
Rome Cable Corporation 134-135
Ross Engineering, J. O. 165
Roura Iron Works, Inc. 234
Ryerson & Son, Inc., Joseph T. 197

Sarco Company, Inc. 187
Sexauer Mfg. Co., J. A. 206
SKF Industries 50
Sly Mfg. Co., W. W. 170
Smooth-on Mfg. Co. 45
Socony Mobil Oil Co. 6-7
Spencer Division
Metals & Controls Corp. 205
Spencer Turbine Company 164
Square D Company 2nd Cover, 203, 3rd Cover
Standard Oil Co. (Indiana) 223
Subox, Inc. 178
Sugar Beet Products Co. 162

Texaco, Inc. 18-19, 149
Thomas Flexible Coupling Co. 4
Torit Mfg. Company 42
Tube Turns Plastics, Inc. 236

Union Metal Mfg. Co. 180
United States Gauge 207
United States Steel Corp. 16-17, 64-65, 225

Veeder Root, Inc. 172

West Chemical Products, Inc. 167
Western Insulated Wire Co. 228
Western Machinery Co. 232
Westinghouse Electric Corp.
12-13, 80-81, 145 thru 148
Wickwire Spencer Steel Div. of CF&I 240
Wiegand Co., Edwin L. 150
Wright Hoist Division
American Chain & Cable Co. 86

Yarnall-Waring Company 32

The Image of CF&I offers
Safe, fast materials handling with

Coburn Overhead Conveying Systems

The CF&I Image stands for the quality of all CF&I steel products made for general industry. For materials handling, he offers Coburn Overhead Conveying Systems because they speed up the spotting of work over machines . . . help eliminate damaged goods resulting from multiple handling. Coburn systems are made from high quality steel, yet they are inexpensive as the sectional design can be adapted to any plant.

There's no installation problem. In fact, the design is so simple and practical that your own plant personnel can install the Coburn system.

CF&I-Coburn also makes a full line of sliding door and fire door hardware. For complete information on these CF&I products, write to Coburn Sales and Engineering, P. O. Box 311, Palmer, Mass.

6604

COBURN PRODUCTS
THE COLORADO FUEL AND IRON CORPORATION
WICKWIRE SPENCER STEEL DIVISION

For more facts circle 660 on Reply Card

New...from MARSH!

MARSH *Master-mite* SOLENOID VALVES

Conduit type Master-mite. Grommet-type also available.

Small solenoid valves that fill a BIG order

Designed to meet the need for positive-acting tight-seating valves for use on wide variety of media, including oxygen, hydrogen, acetylene, etc.

Two Types:
Conduit type and grommet type. Port sizes 1/8" and 1/4" NPT.

Ten orifice sizes:
3/64" through 1/4".

Wide range of voltages:
Standard with 115 V. A. C. but also available in 12, 24, 208, 230, 460 V. A.C.

Pressure to 540 psi.

Small, but with more strength in the Marsh manner. Coils never overheat. Entire assembly leak tight. Remarkably quiet operation. Cleanable without breaking connections. Used in any position. Bodies either brass bar stock or 18-8 stainless steel. All moving parts stainless. Underwriters' approved for use on oxygen and hydrogen and as safety valves.

Write for new bulletin

MARSH INSTRUMENT COMPANY
Dept. W, Skokie, Illinois
Division of Colorado Oil and Gas Corporation
Marsh Instrument & Valve Co., (Canada) Ltd., 8407 103rd St., Edmonton, Alberta, Canada, Houston Branch Plant, 1121 Rothwell St., Sect. 15, Houston, Texas.

For more facts circle 661 on Reply Card

Increase Storage Capacity with a C-F LIFTER

Here's 1 man—a C-F Lifter and an electric hoist handling 5 ton packs of sheet steel with speed, safety and economy. One C-F Lifter handles a wide range of sizes . . . adjustments are made by the operator in a few seconds, permitting the Lifter to shift from wide to narrow sizes in a few seconds. Made in capacities from 2 to 60 tons.

Write for Bulletin SL-30 for specific examples of C-F Lifter operation and economy.

CULLEN-FRIESTEDT CO.
1317 South Kilbourn Avenue • Chicago 23, Illinois

For more facts circle 662 on Reply Card

a New HIGH IN SAFETY AND RELIABILITY!

Only Square D's new combination starters give you all these advantages!

EXTRA SAFETY! • Operating handle permanently attached to switch—eliminates hazard of false handle indication. • Double protection against opening door with switch "ON." • Visible Blades on switch mean safety you can see. • Door must be completely closed before switch can be operated.

REAL RELIABILITY! • Really dust-tight—NEMA 5-12 construction keeps out dust and coolant • Door closes snugly every time—latches at both top and bottom to make tight seal. • Simple closing mechanism—no complicated linkages to get out of adjustment. • Rugged construction throughout for extra-long life.

SO SIMPLE TO USE! • Front operation makes ganging easy. • Plenty of wiring space—all through-wiring with line terminals at top, load terminals at bottom. • Fuse clip-spacing and sizes easily changed to simplify horsepower or voltage change.

***Get the Complete Story** on the newest, safest, most dependable combination starter available*
Write Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin

SQUARE D COMPANY

wherever electricity is distributed and controlled

For more facts circle 663 on Reply Card

Stop these maintenance miseries (and others) in your plant...

Molysulfide™

is the cure!

Sure, problems like frozen nuts and galled spline drives won't put you out of business—but they'll put a crimp in your important maintenance schedules! The answer?

Molysulfide paste lubricants! These special lubricants—containing 25-70% Molysulfide—are tailor-made for the toughest maintenance-lubrication problems you've got. Here's why . . .

Molysulfide films out on metal surfaces. It forms a *rugged, heat- and cold-resistant, low-friction film* that prevents metal-to-metal contact even after man-sized hard knocks have pounded or squeezed base grease away. That's why Molysulfide *stays put* to lubricate as a long-term cure for such headaches as galling and seizing . . . stick-slip . . . chatter, fretting, and a whole host of other miseries. *But see for yourself!*

Try Molysulfide paste lubricants in your own shop. *Try just one pound*—order it from any of the manufacturers listed below. You'll agree—Molysulfide is worth its weight in aspirin! *Climax Molybdenum Co., a division of American Metal Climax, Inc., 500 Fifth Ave., New York 36, New York.*

CLIMAX MOLYBDENUM

Try a pound of Molysulfide paste lubricant for heavy-duty maintenance applications! Order it today from any of these well-known manufacturers: Acheson Colloids Co., Port Huron, Mich. • The Alpha Molykote Corp., 65 Harvard Ave., Stamford, Conn. • American Lubricants Co., 1227 Deeds Ave., Dayton, Ohio • Baso, Inc., 730 W. Jackson St., P. O. Box 461, Mil Milwaukee 1, Wisc. • Bel-Ray Co., Green Village Rd., Madison, N. J. • Bemol, Inc., 131 State St., Boston 9, Mass. • Fiske Bros. Refining Co., 1500 Oakdale Ave., Toleao, Ohio • Hohman Plating & Mfg. Co., Inc., 905 East 3rd St., Dayton, Ohio • Jet Lube, Inc., 3093 N. California St., Burbank, Calif. • McGee Chemical Co., 8000 West Chester Pike, Upper Darby, Pa. • Ore-Lube Co., 11 Front St., New York, N. Y.

For more facts circle 664 on Reply Card